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The Eiderlinsky Gold Mines

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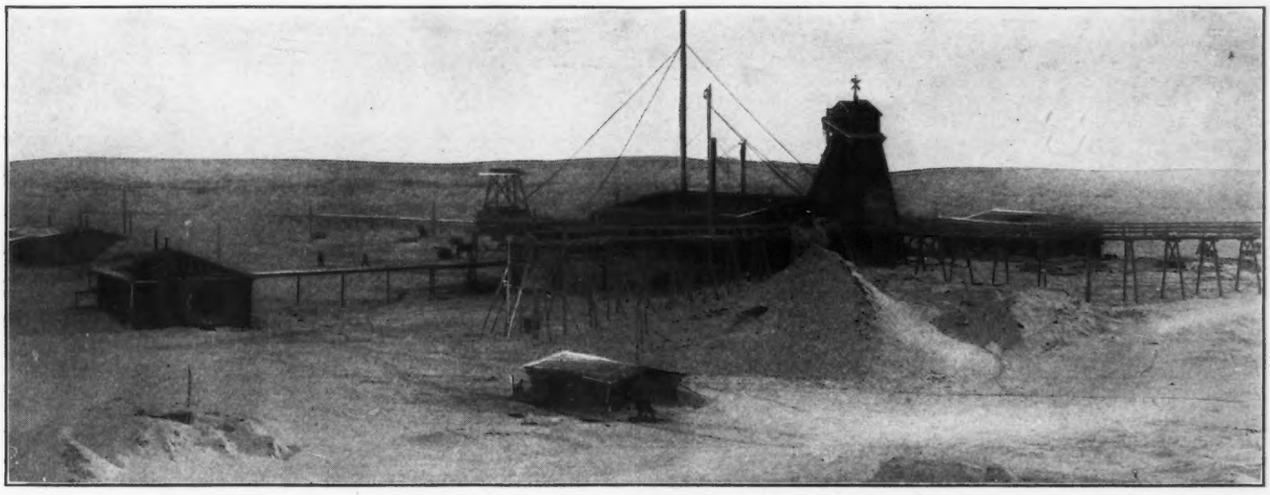
SYNOPSIS—The Russian Gold Exploration Co. controls about 14,000 acres near Eiderla, 130 miles southwest of the Ural Range. Quartz veins in granodiorite are mined from one inclined and three vertical shafts. Scarcity of labor prohibits hand drilling. Machine drills and drill sharpeners of American manufacture are used.

The Eiderlinsky mines of the Russian Gold Exploration Co. are situated in the Government of Orenburg, Russia, 93 miles east of the town of Orsk and 180 miles south of the town of Troitzk. The camp lies southwest of the Ural Range, which is about 130 miles distant. The neighboring large mining camps are Baymak (Tanalyk Corporation, Ltd.), 95 miles northwest, producing copper, gold and lead, and Kochkar, 200 miles north-northwest, representing the most important gold field in the South Ural range.

The Russian Gold Exploration Co. (Rossiiskoye Zolotopromishlennoye Obschestvo) has at Eiderla a group of 63 claims, covering 14,033 acres. The gold-bearing veins are connected with a granodiorite mass, which represents the country rock. The granodiorite occupies an area about 4½ miles north and south and 1¾ miles east and west. The adjacent rocks are: On the eastern side, amygdaloids, porphyries, quartzite and schists; on the southern side, granodiorite is adjoined by amygdaloids, porphyry, quartzite and serpentine; the western contact of granodiorite is amygdaloid, quartzite and limestone; to the north lie porphyry, amygdaloid, limestone and a vast area of microcline granite. The rock of greatest importance to the mine is the granodiorite; the richest claims are located on this formation or on its eastern contact with the porphyries.



Lomanaya Shaft of Russian Gold Exploration Co., Government of Orenburg, Russia

Quartz Veins in Granodiorite

Only a few of the 63 claims are developed and working now. The rocks are similar to those of the Kochkar district. Three principal veins are now developed and working—Uklonnaya, Miasskaya and Safonovskaya. The vein matter is white quartz with a small quantity of disseminated sulphides; gold is found either in native form or with the sulphides of arsenic, antimony and silver. Hanging and foot walls of the veins are granodiorite, often altered and sometimes soft and likely to cave.

The dips of the various veins are decidedly different. The principal vein of the mine, Uklonnaya, has an average dip of 28° E, and the strike is 5° NE. The average width of the quartz vein is 3½ ft., ranging from 2 to 10½ ft. As a part of the hanging and foot walls of the vein contains gold, the average working width is 4½ ft. One square sagene[1] of the vein contains 21 short tons of ore. All veins split frequently into two or three parallel veins separated by areas of country rock from 6 in. to 2 ft. thick.

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[1] 1 sagene = 7 ft.; 1 sq. sagene = 49 sq.ft.

The Miasskaya vein dips 70° N, and the strike is 77° NE. The average width is 3 ft., varying from 2 to 7 ft. One square sagene of the vein contains 17 tons of ore. The Uklonnaya and Miasskaya veins are at an angle of 70° to each other.

The Safonovskaya vein has a strike 23° NW and dips 71° SW. One square sagene of the vein gives 15 tons of ore, the average width being 2 ft. There are many other quartz veins in the deposit, part of them being of milling value.

Three Vertical and One Incline Shaft

Mining is carried on through four principal shafts of rectangular section. Three of the shafts are vertical: Lomanaya is 280 ft. deep; Miasskaya, 370 ft.; and Safonovskaya, 210 ft. Uklonnaya is an incline 1000 ft. deep on the vein. Lomanaya and Uklonnaya shafts are on the Uklonnaya vein; the Miasskaya and Safonovskaya shafts are on the two corresponding veins.

All vertical shafts are of the same size, having four compartments arranged in a straight line. The length of the shafts inside the timbers is 13 ft. 1 in. and the width 4 ft. 4 ½ in. The two hoisting compartments are 4 ft. 4½ in. by 3 ft. 6 in. each; the ladderway and manway is 4 ft. 4½ in. by 2 ft. 4 in. A pump compartment is arranged for carrying pipe lines. The shafts are cribbed with 7-in. round timber, hand-framed; 4x3¾-in. guides are used, held by 8x¼-in. nails. Native fir timber is used in all shaft work; this is obtained from forests 40 miles distant. Hoisting in vertical shafts is done on one- and two-deck cages.

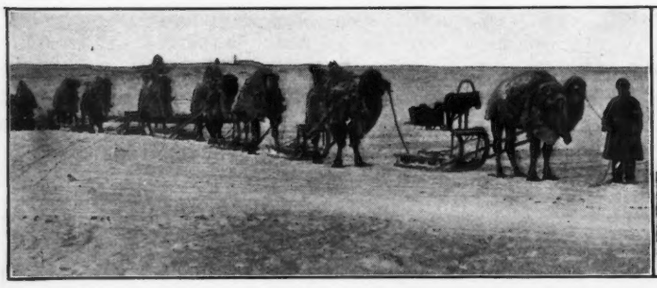
The Uklonnaya incline is in the vein and has dimensions 13 ft. 9 in. by 7 ft. 2 in., outside of the timbers. This shaft has three compartments, two hoisting ways 5 ft. 7 in. by 3 ft. 2½ in. in the clear and one manway 5 ft. 7 in. by 2 ft. 9 in. Hoisting is done by cars in trains of two or three cars on an 18-in. track of 5-lb. rails.

Shaft Equipments

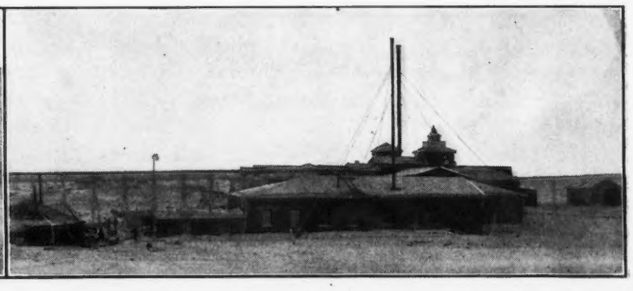
The property heretofore has not been equipped with a plant sufficient to produce the proper amount of tonnage. Lomanaya shaft is equipped at present with a Davey, Paxman & Co. 12x14-in. double-cylinder winding engine; four Davey, Paxman & Co. locomotive-type boilers, two of 726 and two of 565 sq.ft. of heating surface, built for a working pressure of 140 and 120 lb. respectively; one Ingersoll-Rand class A 18x18¼x18-in. steam-driven air compressor, and several Cameron underground pumps. One compound 16x10x14-in. Imperial type XB-2 air compressor is driven by a 110-hp. Wolf type CL-IV locomobile, which also drives one 11-in. Cornish pump. Fifteen drills are working from the Lomanaya shaft. Besides the drills, the compressors furnish air underground for pumps and two 5x7-in. double-cylinder Holman hoists.

One Cockerill double-cylinder hoisting engine is installed at Uklonnaya shaft, steam for which is furnished at 75-lb. pressure by a Cornish boiler having 384 sq.ft. of heating surface. The air-compressor plant at Miasskaya shaft consists of one Imperial type XB-2 14x9x12-in. air compressor driven by one 85-hp. Wolf type CL-I locomobile, which also drives one 7¾-in. Cornish pump. Two 30-hp. Paxman locomotive-type boilers generate steam at 120-lb. pressure for a 12x14-in. double-cylinder winding engine made by Davey, Paxman & Co. and several Cameron pumps in the mine. At the Miasskaya shaft there is also one Flottmann single-cylinder, belt-driven, class K-25 compressor, which delivers 300 cu.ft. of free air per minute and is driven by one vertical 10x10-in. Tangye steam engine. Another Flottmann compressor, class K-18, for 230 cu.ft. per min. was used at the Miasskaya shaft previously, but did not prove so efficient as those of Ingersoll-Rand make.

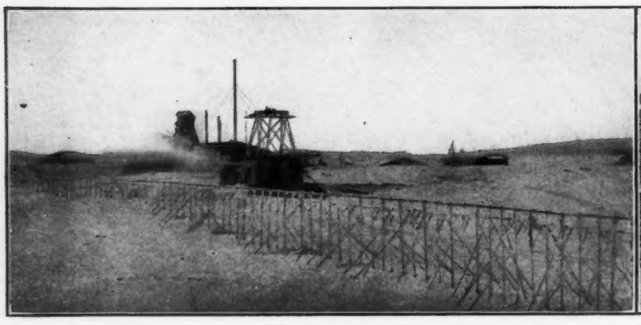
There are two 30-hp. Paxman boilers at the Safonovskaya shaft supplying steam at 90-lb. pressure for one



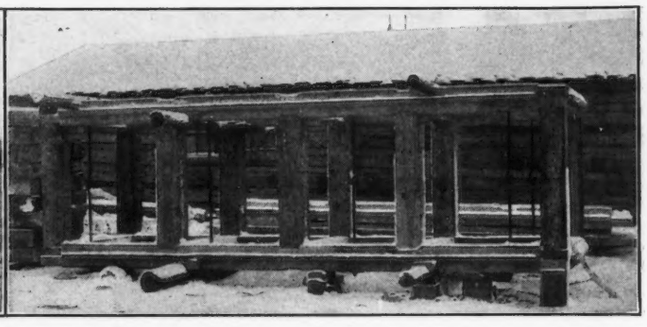
Camel Train Starting on a Trip for Timber



The Mill at Eiderla, Orenburg, Russia



Erecting the Headframe of the New Kapitalnaya Shaft



One Set of Timbering for the Kapitalnaya Shaft

12x14-in. Paxman winding engine and for an engine driving an 8x8-in. Ingersoll class NE-1 straight-line air compressor.

Drilling Equipment

The drilling equipment at the Lomanaya shaft consists of C-110 Ingersoll-Rand butterfly-valve 2¾-in. piston drills for general use in drifting and stoping; for drilling in hard quartz, six E-24 Ingersoll 3¼-in. drills are used. There are also a few A-86 2¼-in. drills, which have proved useful in soft rock, drifting along faults, cross-cutting in altered granodiorite, etc.; however, they will be replaced in the future by C-110 drills, which are lighter and more efficient. Jackhamer BCR-430 drills are used for down holes in underhand stopes and BC-21 butterfly-valve telescope-feed hammer drills for raises and starting ore chutes.

At Miasskaya and Safonovskaya shafts, with the vein dipping 70°, Ingersoll-Rand BC-21 butterfly-valve stoping drills are in use now, with a few Ingersoll MC-32 and Sullivan DA-21 stoping drills.

To standardize the work, the management will in the future use only C-110 piston drills for all drifting and stoping in the flat Uklonnaya vein, BC-21 for all stoping in Miasskaya and Safonovskaya veins, and BCR-430 for down-hole drilling.

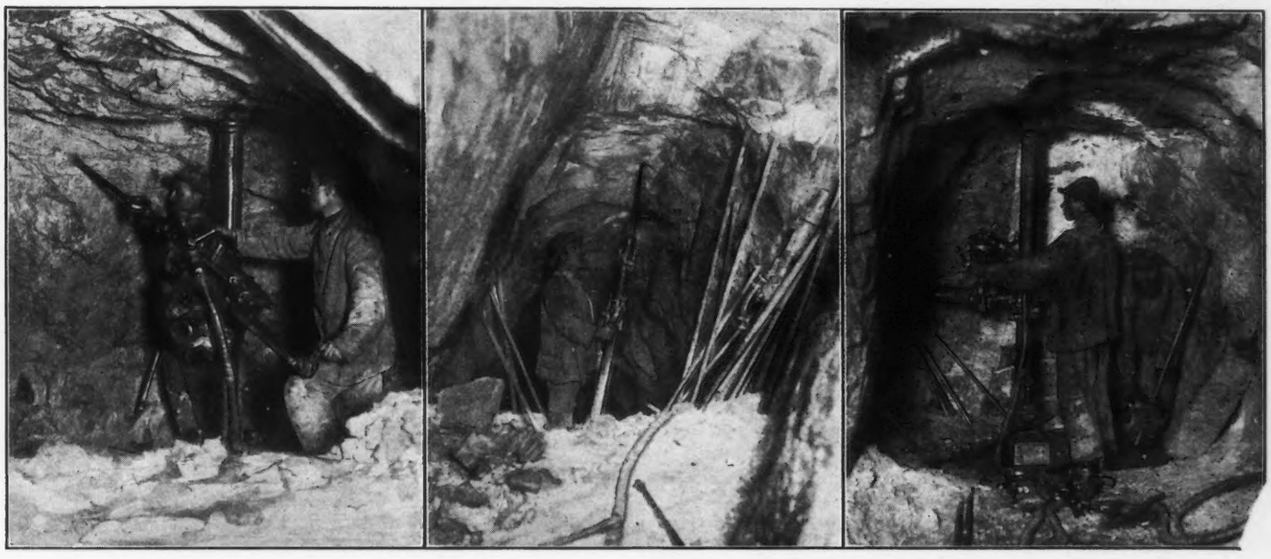
Methods of Mining

On the Uklonnaya vein the levels are 105 ft. apart. The vertical Lomanaya shaft cuts the vein at the depth of 280 ft. A station is cut and the fourth level established approximately 420 ft. on the incline below the outcrop; above this level all operations were carried on through this shaft, but these have been discontinued except for pumping, hoisting men and lowering the timber. Almost all ore now mined is hoisted through the inclined Uklonnaya shaft from the third, fourth and fifth levels, where stations are established.

The drifts are single track, 7x6 ft. outside the timbers. For a distance of 28 ft. from each station, the drifts are of double-track size, 7x10½ ft. The drifts are timbered with 8-in. round timber, 5-ft. cap, 7-ft. posts and 3- to 5-in. lagging. The sets are 3 to 4 ft. apart.

When beginning stoping operations, a raise is cut from the drift to the level above and a breast is started in the direction of the strike for the whole length of the raise, a pillar 7 ft. wide being left to protect the level. The stope consists of several (five to seven) faces, each 14 ft. long; the lowest face is carried 4 to 7 ft. in advance of the one above, and so on, the successive arrangement of the faces being as in overhand stoping. Where the hanging wall near the vein is weak, stull timbering of the stope is necessary, using slab lagging 3 to 5 in. thick and 5- to 9-in. posts. The ore is shoveled from the stopes to the chutes. After the ore is taken out, stopes are partly filled with the waste, if such is available from the level above, and partly caved. Four levels are working on the south and two levels on the north.

Stoping is done mostly on contract with hand drilling. The miners are paid at so much per square sagene; where machine drilling is used in stopes, the miners are paid for extra vershoks[2] drilled during one 8-hr. shift above a certain length of hole. The contract prices for stoping vary from 25 to 50 rubles per square sagene ($9 to $18 per square fathom) of the vein for breaking ground, including timbering, explosives and candles. A close supervision is necessary to avoid breaking waste with the ore, especially when adjacent to a soft hanging wall.



Drilling by Contract in the Eiderlinsky Mines of the Russian Gold Exploration Co.

Miasskaya shaft is 370 ft. deep and has three working levels—230, 300 and 370 ft. deep. The shrinkage system is in use at the third level. The length of the stope is 140 ft., its back being horizontal. Since the distance between levels is but 70 to 100 ft., no raise is previously made to the level above, two manways being timbered in each stope from the drift each side of the stope and ladders installed. One floor from the back of the level is timbered with stulls lagged with 5-in. round timber, and "Chinaman chutes" are put up every 20 ft. Stoping is begun from this second floor and carried on vertically, the broken ore accumulating on lagging. The back stands well without support; the ore is kept 6 to 7 ft. from the back and 7-ft. pillars are left under the level above for protecting it when

[2] 1 vershok = 1¾ in.

filling the stope with the waste. Ingersoll BC-21 telescope-feed hammer drills are used in the stopes, one man operating each drill. No timber or support is required except for the two manways and the first floor.

Underhand stoping is carried on in the second level east with stull timbering and double-hand drilling. Overhand stoping with the use of stulls is carried on at the first level of Miasskaya shaft and in Safonovskaya shaft, filling being occasionally used. Owing to the high price of timber, the management is going to put in practice the shrinkage system for all veins of steep dip.

Hand and Machine Drilling by Contract

Through shortage of labor, machine drilling is the general practice at these mines, but double-hand drilling is used where machines are not working. Three shifts of 8 hr. are worked. A bonus system is used with hand drilling; two men have to drill from 30 to 40 vershoks (4 ft. 5 in. to 5 ft. 10 in.) for a fixed wage of one ruble. For holes drilled beyond this length, the drillers are paid 5 kopecks (2½c.) for every vershok. The task is 30 vershoks in overhand stoping where holes are horizontal and 40 vershoks in underhand stopes where holes are vertical. The sizes of the bits for hand drilling are 1½, 1⅜, 1¼, 1⅛ and 1 in.; ⅞-in. octagon steel is used. Two drillers make up to 10 ft. of holes during the 8-hr. shift.

In raises only machine drilling is used. Task work is used also in machine drilling. The shift task for one C-110 drill is 80 vershoks (11 ft. 8 in.) for which the machineman gets one ruble and the helper 80 kopecks. The men are paid, besides these wages, a bonus of one kopeck for every extra vershok drilled during the shift. Solid 1-in. octagon steel is used for machine drilling; solid cross-bits are used for piston drills, the sizes being 2¼, 2, 1¾, 1½ and 1¼ in., and high-center cross-bits, 2, 1¾, 1½ and 1¼ in., are used.

Drill Sharpening

Special attention is paid to drill sharpening. All drill sharpening is done with machines. One Ajax D-24 drill sharpener is used at Lomanaya shaft and one Leyner TR model 5 drill sharpener at Miasskaya shaft, the latter

DRILL SHARPENING AT MIASSKAYA IN JUNE, 1914

Drills sharpened:	
Chisel bits for hand drilling, ⅞-in. octagon steel	5,874
High-center cross-bits for telescope-feed hammer drills, 1-in. octagon steel	4,286
Cross-bits for piston drills, 1-in. octagon steel	1,026
Total bits sharpened	18,306
Bits sharpened per 8-hr. shift, 232.	
Sharpening expenses:	Rubles*
Blacksmith's wages, 79 eight-hour shifts	84.20
Helper's wages	51.90
Total labor	136.10
Oil used, 201.15 poods at 1 ruble	201.15
Power (air), 79 shifts at 2.48 rubles	195.92
Total	533.17
Cost of sharpening one drill bit:	Kopecks*
Labor	0.74
Oil	1.10
Air (power)	1.06
Total	2.9

making also 1⅛-in. hexagon drill shanks for telescope-feed hammer drills and square shanks with collar on hollow round steel. To standardize work, all shanks on solid steel are of one type and size. The Leyner drill sharpener, in connection with the Leyner No. 5 oil forge, proved to be an excellent equipment for sharpening and shanking of all kinds. Sharpening results

*One ruble = $0.515. One kopeck = $0.00515.

at Miasskaya shaft for June, 1914, are given in an accompanying table.

The cost of sharpening per drill in July was 2.74 kopecks (1.3c.); the total number of bits sharpened during the month was 18,170. Operating the sharpening machine is not difficult, and common smiths soon become accustomed to it. Good work, of course, requires time. The cost of sharpening by hand one chisel bit is 2.9 kopecks (1.49c.) and one cross-bit 7.59 kopecks (3.91c.). For drilling, Russian steel, costing 2.50 rubles ($1.29) per pood (36 lb.), from the Zlatoust Government steel works is used. The tempering of the bits is done in a long wooden tank, 1 ft. deep and 1 ft. wide, with a grate permitting the bit to be immersed to a depth of ¾ in. The water inlet is at the bottom and the outlet ¾ in. above the grate; a small flow of fresh water is permitted.

I consider it impossible to get good results in machine drilling without machine sharpening. In an accompanying table are given the results of machine drilling at the Miasskaya and Lomanaya shafts during the month of June, 1914. The cost of mining at Lomanaya shaft in March was 9.91 kopecks per pood ($2.83 per ton), 249,277 poods being hoisted.

New Vertical Shaft Being Sunk

The company is sinking a new vertical shaft, Kapitalnaya, which should reach the Uklonnaya vein at the depth of 100 sagenes (700 ft.). The shaft has four compartments—two skipways, 4x5 ft. each; one ladderway, 3½x 5 ft., and one pump compartment, 4x5 ft. inside the

MACHINE-DRILLING RESULTS IN JUNE, 1914

	Miasskaya Shaft	Lomanaya Shaft
Piston drills E-24, C-24, C-110, A-86, shifts	91	556
Telescope-feed hammer drills BC-21, MC-32, DA-21, shifts	563½	15
Total vershoks drilled	58,564	61,011
Vershoks drilled per drill-shift	89.48	107.00
Vershoks drilled per man-shift	78.42	54
Holes drilled	2,624	2,234
Average depth of holes, vershoks	22.32	27
Dull bits	11,590	6,081
Dull bits per one arsheen* of hole	3.16	1.6
Cost of air per drill-shift, rubles	2.48	3.37
Cost of operating one drill per shift, including labor	4.08	6.71
Cost of drilling one vershok of hole, kopecks	5.69	6.27
Steel consumption, poods	19½	11¾
Cost of breaking one square sagene of the vein	61.32	74.85
Cost of drilling one vershok by hand, kopecks	8.46	9.02

*1 arsheen = 28 in.

timber. All compartments are arranged in one line, making the total dimensions of the shaft 17 ft. 6 in. by 5 ft., inside the timber, and 19 ft. 2 in. by 6 ft. 8 in., outside the timber. The shaft is timbered by 10x10-in. square timbers. Each set consists of two wall plates, 19 ft. 2 in. by 10 in. by 10 in.; two end plates, 6 ft. 8 in. by 10 in. by 10 in.; three 10x8-in. dividers, and 10 posts, 4 ft. 2 in. The hanging bolts are of 1⅛-in. best Taguil (Ural) iron, four bolts being used on each side-wall plate. The guides are of 6x5-in. section; 2-in. lagging is used on the walls outside the timber. Much care is paid to good wedging of the timber. This kind of timbering compared with old-type cribbing permits of much greater speed in sinking. The total cost of such timbering per square sagene is 145.22 rubles.

All the ore from the mine is transported by teams to the mill one mile distant at the price of 60 kopecks per 100 poods. There are 12 chilean mills, running from 12 to 15 r.p.m., and each treating up to 1200 poods (20 tons) of ore in 24 hr. The mill treated 3,753,994 poods (70,000 tons) of ore during the first 11 months of 1913,

with average recovery 5.73 zolotniks per 100 poods (0.424 oz. per ton) by amalgamation. The ore is in the main free milling and the extraction is 87%. The average contents of tailings for the period from Aug. 20 to Dec. 1, 1913, were 0.52 zolotnik of gold and 1 zolotnik of silver per 100 poods.

The mine has good possibilities when the railroad line from Troitzk to Orsk is constructed; this line will pass about five miles from the mine and will connect it with collieries situated 140 versts to the north. Development of the collieries has already been commenced by a private company and a contract entered into for coal for the Russian Gold Exploration Co. This will reduce the cost of fuel by half; the present fuel at the mines is wood. Plans have been made for erecting a 1500-kw. central electric station, which will greatly reduce the power costs. With the completion of the railway, the mine will have the possibility of obtaining cheap outside labor, the local population not being sufficient.

Koyukuk Placer-Mining District

SPECIAL CORRESPONDENCE

Wiseman, the principal town, is 633 miles up the Koyukuk River on the middle fork, 150 meridian and 67 parallel. The post office is called Nolan. Light-draft stern-wheel boats make from three to five trips up the river during the summer as far as Bettles, which is 543 miles from Nulato at the junction of the river with the Yukon. From Bettles to Wiseman the freight and passenger business is handled on small scows drawn by horses. The freight rate on this haul is 7c. per lb.; so it is evident that all food and mining supplies are expensive. Owing to the long distance from civilization, only the hardiest men come here to prospect. The district has been self-supporting—that is, no one has brought any large amount of money to invest.

The present winter has been unusually mild—in fact, not cold enough to suit the operators, and a number were delayed in commencing operations due to the streams not freezing up until late. The coldest weather experienced up to Apr. 1 was 42° below zero, and that cold snap did not last more than a week. The snowfall has been heavy—about 2½ ft. on the level.

POINTS OF ACTIVITY

The points of most activity this winter have been the following: The Hammond River, a stream which empties into the Koyukuk about four miles above Wiseman; Discovery claim, which is about 1½ miles from the river mouth, and No. 1 Above, which was located by "Fiddler" John, who first found pay in the deep channel. "Fiddler" John sold out to Plummer, Ellingston and Gilbert for a large sum of money, and two years ago left for the outside in a motorboat in the company of three men and one woman. One of the party killed and robbed "Fiddler" and the others. The present owners sank a new shaft this winter, but struck the rim. They put down an incline some 80 ft. to prospect the ground, but encountered water. It being so late in the season, they have quit until next fall, when a suitable pump will be put in.

Collins and Dow have pumped out an old shaft on No. 2 Above and intend taking out the gravel along the rims, which were formerly thought not rich enough to pay for handling. No. 3 Above is being worked by Kelly & Co. in good pay. Bedrock of the deep channel at this point is about 95 ft. deep and about 18 ft. wide. The ground is thawed and full of big boulders, which taxes a man's skill to handle, as the roof must be constantly forepoled.

Vernon Watts is operating on the upper end of No. 3 Above. He tried to get three different shafts down during the early winter, but on account of mild weather the stream was not frozen enough and he had to give it up. He is now driving to the ground from an old shaft some distance below.

Ellingston and Smith are reworking the middle third of No. 4 Above, which last season produced a $2500 nugget. Their "pickups" during the past week have amounted to $7000. On this part of the river the operators figure the ground yields in the dump about twice the amount of the "pickups." The latter consist of nuggets from $5 up. They lie principally in the mud-filled cracks of the bedrock. The operators are taking up about 3 ft. of bedrock or to the clean bedrock. The largest nugget found this year was worth $252, figuring at $18 an ounce.

Holzer, Wilson and Ellingston are working the upper third of No. 4 and reworking part of the middle third, and have a considerable dump. They have found a $556 nugget. They are employing 16 men, the largest force on the river.

Bob Crawford owns and is working No. 5 Above, but the ground has not proved so rich as the claims below, since the gold is much finer. He was drowned out last month, but has secured a pump and is now endeavoring to unwater the workings. No. 6 Above is shallow ground and has never produced much. The ground above this has not shown pay.

HAMMOND RIVER DISTRICT

Hammond River above discovery has been famous for its coarse gold, but there are no paystreaks in the district. Gold is found in spots, such as under a big boulder, a crevice, or a boil-hole. One boil-hole on No. 2 Above, about the size of a barrel, yielded over $10,000. A crevice on No. 3 yielded $19,000.

From present indications Hammond River will produce this season something over $125,000, which will work out nearly all of the virgin frozen ground. On No. 1 Below, Corbett brothers are sinking an incline shaft to bedrock, but cannot complete the work this season. This lower Hammond River ground has live water on bedrock, and no one has large enough equipment or capital to undertake working the ground. Swift and Vermont Creeks, which are short, steep creeks emptying into Hammond, are shallow diggings and have been worked out.

Nolan Creek, which empties into the Wiseman, has produced a number of small fortunes during the last eight years, but was considered about worked out. It is showing up well this season. Benson & Co. sank a shaft on a small piece of virgin ground on No. 2 Below and have found good pay. Posthelwate and Wool have found good pay on No. 4 Below. There are two other outfits working on No. 1 and No. 4. Herley and Hilberg are taking a dump out on Smith Creek, which empties into Nolan Creek.

OTHER RIVERS AND CREEKS

Across the divide from Nolan Creek, about five miles away, two prospecting parties have been sinking on Glazier Creek, which empties into the north fork of Wild River. Some years ago Mascot and Washington Creeks,

which are the headwaters of Glazier, produced considerable gold, and since that time every effort has been made to find pay in the main stream. Jim Stevenson and partners have just completed a hole to bedrock, 164 ft., but failed to find anything. Ness and Charlton, above them, sank 230 ft. and have not found anything. Glazier is a good-sized stream, and the location of "pay" would open up at least three miles of ground.

About 10 years ago there was a stampede into John and Wild Rivers, but the ground was not thoroughly prospected and nothing worth working was uncovered. Since that time a few men have been going into that country, and last fall Joe Matthews came out from Wild River with $5000 that he ground-sluiced on Jay "pup." This caused another renewal of interest in this part of the district. About 40 men spent the winter there, but as yet nothing has been found. As usual, there are many different opinions regarding the country. It seems probable that some good spots will be found on the small "pups" both on Wild and John Rivers, which run nearly parallel.

Jay empties into Rye Creek, and Rye into Flat Creek, which is a fork of Wild River. Several holes were started on Rye, but encountered water, and it will be necessary to get in boilers and pumps to prospect this ground.

One hole was sunk on Flat Creek. After getting down about 100 ft. in the gravel, they encountered clear ice, and went down 100 ft. in this, and worked a piece of pipe down 30 ft. more and quit without finding bedrock. Larson and Jensen own Nos. 1 and 2, Fred Swift owns No. 3 and A. Tobin owns No. 4, all on Jay "pup."

Nothing of interest has been found on John River, except that Bruno Keller and M. Camant have located some pay in shallow ground on Crevice Creek.

There are a few prospectors on Linda, Sheep, Marion, Minnie, Myrtle and Hackett Creeks. Marion deep channel has never been worked on account of live water on bedrock. There are several men shoveling in on Myrtle Creek each summer.

Pingle, Williams and Watts have good bench claims on Nolan Creek that they work each summer, but a limited water-supply handicaps their operations. Smith and two partners are hand-drilling the benches near the mouth of South Fork of the Koyukuk. The South Fork benches are extensive and if the drilling proves them up favorably, there undoubtedly will be considerable activity at this point next year. It is estimated there are about 250 men in this district, and all are hoping that some new diggings will be formed soon.

Production of Pyrites in 1914

The production of pyrites in the United States in 1914, according to W. C. Phalen of the U. S. Geological Survey, was 336,662 long tons. In 1913, the production was 341,338 tons. Virginia was the leading state both in production and in value. The output of this state diminished slightly in 1914, as compared with 1913. The output in California showed a slight gain, and there was a substantial gain in the production in New York, which, though ranking third in production, stands second in value. In Illinois, where pyrite is obtained as a byproduct in connection with coal mining, the output more than doubled that for 1913. In Indiana, where, as in Illinois and Ohio, pyrite is obtained in connection with coal mining, there was a slight increase. In Wisconsin, Ohio and Missouri there was a decreased production. In Georgia there was a slight increase.

The imports of pyrites for consumption in 1914 were 1,026,617 long tons, valued at $4,797,326. These figures show a marked increase compared with the imports of 1913, which were 850,592 tons.

Butte & Superior Copper Co.

The report of the Butte & Superior Copper Co., Ltd., for the first quarter of 1915 shows that 117,860 dry tons of ore were milled, the average content being 17.356% zinc and 7.95 oz. silver per ton. There was produced 70,634,000 lb. of zinc concentrates containing 52.9246% zinc and 22.6488 oz. silver per ton. The mill recovery of zinc in concentrates was 91.319%. Mining cost was $3 per ton, and milling cost, $1.8659 per ton, or a total cost of $4.8664 per ton.

The total net value of the production, including miscellaneous income, amounted to $2,011,510. The operating costs were $848,354, leaving a profit of $1,163,156. The profit is based on 7c. spelter for January and 8½c. spelter for February and March, or an average of 7.99c. The actual amount realized will probably be in excess of this estimate.

Mineral Production of British Guiana in 1914

According to U. S. Consular reports, summarized from official returns, the gold production of British Guiana was $1,106,783 in 1914, showing a decrease of $272,195, or 19.7%, from 1913. About one-sixth of the gold in 1914 was from dredge operations; the balance from placer washings. Quartz and hydraulic mining were at a standstill. By districts, 28,200 oz. were reported from the Cuyuni; 16,400 oz. from the Mazaruni; 14,800 oz. from the Potaro and 10,700 oz. from the Barima.

Notwithstanding the collapse in the diamond trade caused by the war, the exports of diamonds in 1914 were 9582 carats valued at $86,497, against 7217 carats valued at $66,781 in the previous year.

The deposits of bauxite on the Demarara River about Wismar have been investigated and found of importance. Several leases on these lands have been entered, and arrangements have been made to begin work at once, exporting the materiai to the United States.

Russians Set Oil Wells Afire

According to dispatches from Berlin, news from the Galacian front concerning the retreat of the Russians indicates that they fired twenty or more oil wells in the oil-producing region between Boryslaw and Drohobycz, lying to the west of Stry. Although the fires have been brought under control by the Austrian and German troops, the whole territory is covered with smoke. The blazes were extinguished by choking the wells with earth.

The Russians had been using the wells for the production of illuminating oil, benzine, and wax. They are said to have spared the English and French wells, but damaged the oil-carrying apparatus and railroad stations, and carried away tank cars. The Austro-German forces recaptured the mineral wax mines at Boryslaw, the only ones in Europe. Their annual product is valued at 3,000,000 crowns ($600,000).

Development Methods at Fairbanks

By Hubert I. Ellis*

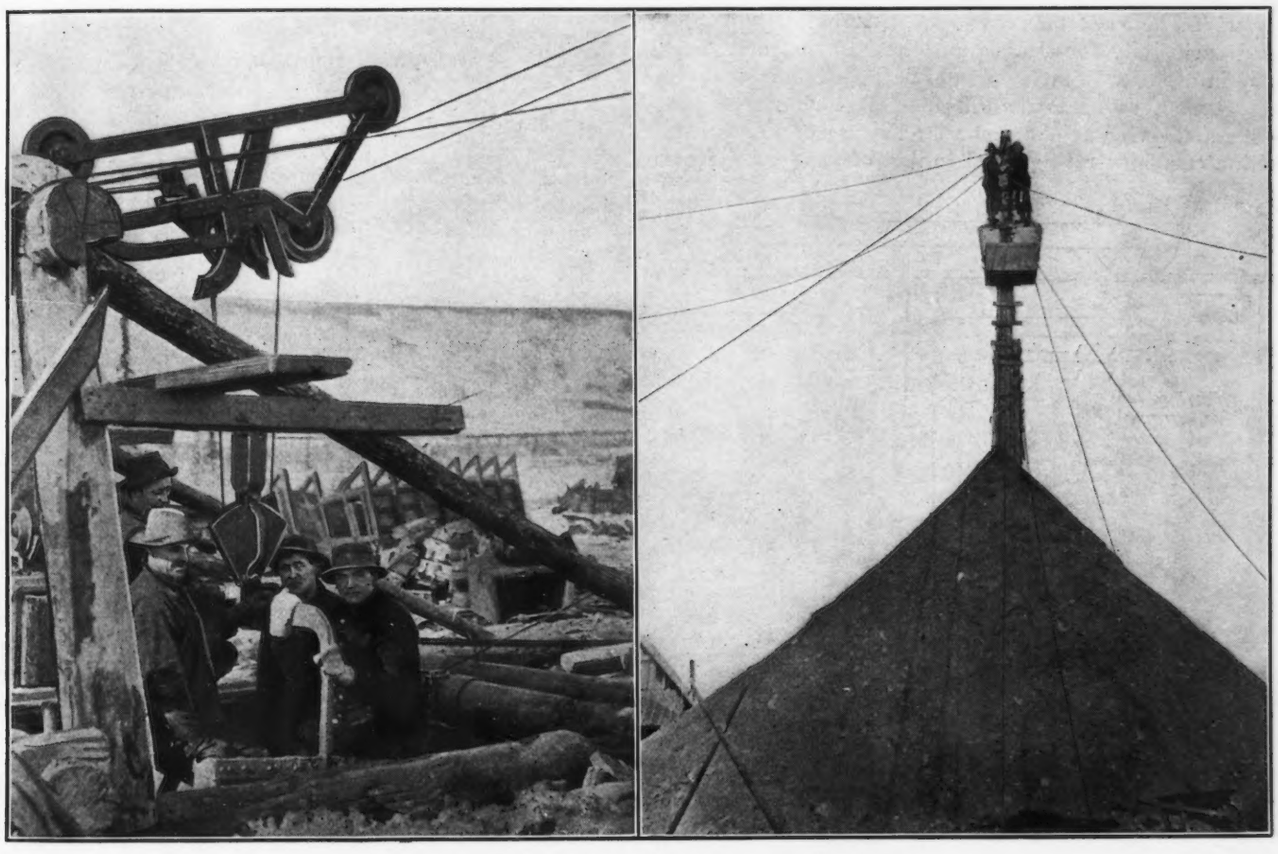
SYNOPSIS—Development methods differ for summer and winter work, material being sluiced as fast as extracted in the former case and stored for spring sluicing in the latter. Wide orebodies are developed by shaft and drifts in four directions. Timbering is usually required, sometimes to a large extent. All plants are erected as cheaply as possible, since the life of a deposit is short. Special hoisting and transportation methods and devices have been developed.

No two Fairbanks placer miners have exactly the same ideas as to the best methods for working a given block of ground. There are certain broad principles to which all must adhere, but each varies the details in accordance with his individual judgment. It is not feasible to describe all the variations in practice, or even such as I personally know, but it has been attempted in the present description to outline the practice that appears, from my own experience and observation, to be best and most representative. Other operators will find much to criticize, but this, far from being the last word on the subject, is intended to be only the first.

Two broad divisions may be made of placer mining at Fairbanks—summer mining and winter mining. In summer work the gravel is sluiced and the gold recovered as fast as it is removed from the mine; in winter mining the gravel is stored on the so-called "winter dumps" at the surface and sluiced as early as possible in the spring by means of water from melting snow. Hoppers are sometimes built and the gravel stored for several days or weeks in summer when the water supply is uncertain, but this is not the usual practice.

Summer mining may be further divided into drift mining and opencut work. Drifting in summer—the ground being prepared during winter by sinking the shaft, driving tunnels, installing machinery, erecting sluice-boxes, and doing other dead work—has contributed much the greater proportion of the $64,000,000 credited to the Fairbanks placer mines during the last 10 years. This method being the most important, as well as the most representative of the practice developed in the district, will be described first in its application to fairly wide paystreaks, say 60 ft. or more. Opening up or developing a mine for winter or for summer work is done in much the same way, except as to timbering, and the following description is characteristic of both, though strictly applicable only where the ground is being prepared for summer mining. Drift mining in narrow and irregular paystreaks as carried on in the Vault Creek portion of the district follows a different practice and will be described later.

In opening up a block of placer ground it is essential that the approximate location of the paystreak be known



Fairbanks Overhead Carrier and Bucket

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from previous prospecting or other work. The paystreak may be directly under the present creek, as at Discovery, Cleary Creek, or it may be a thousand feet or more away, as on Engineer Creek. The place of the paystreak being known, the first step in preparing a block for mining is choosing the site for the shaft. If the pay is more than 50 or 60 ft. wide, it is usually aimed to sink as nearly in the center as possible, to avoid moving the dirt underground farther than is necessary. With narrow paystreaks it is often better to sink on the lower side, or even in waste, to facilitate drainage, if, as sometimes happens, the bedrock is slightly higher under the pay than a few feet toward the creek.

The site for the shaft having been chosen, the next step is placing the boiler and hoist, and this involves the selection of the "plant." A mining outfit at Fairbanks is rated according to the nominal capacity of the boiler or boilers. A "50-horse plant" is therefore one that includes a 50-hp. boiler, hoist, cables, blocks, bucket, wheelbarrows, points, etc., in such number and such sizes as are best suited for use with a boiler of that capacity. Horizontal boilers are used exclusively for sizes larger than 10 hp., and these vary in capacity from 12 to 100 hp. The larger sizes are not popular, owing to the difficulty of moving over poor roads and owing to the fact that the use of two boilers with a combined rating equal to that of one larger boiler

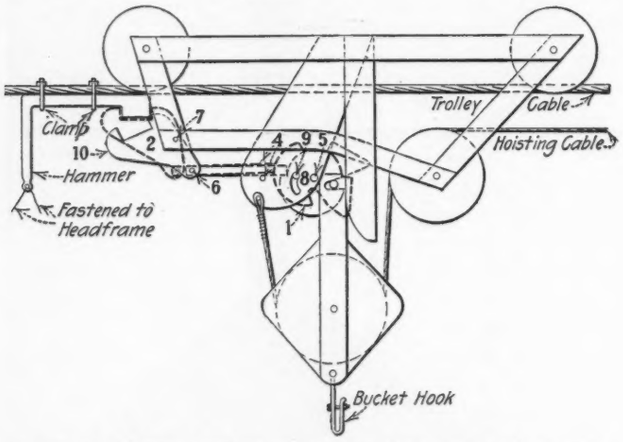


FIG. 1. FAIRBANKS AUTOMATIC OVERHEAD CARRIER

permits of one being cleaned while the other is in use. This is important when, as frequently happens, the feed water is muddy or otherwise impure; but it is a point that is often ignored, boilers sometimes being run for weeks or months on muddy water without other attention than "blowing-off" through the mud-valve two or three times a day.

For sizes smaller than 30 hp. the Scotch marine type is usually preferred, but for larger sizes the Pennsylvania return-flue tubular is very popular. Some operators conserve their wood supply by covering their boilers with asbestos, which gives an increased efficiency of about 16%; but this has the disadvantage of leaving the boiler house prohibitively cold during winter and part of the sluicing season. It is probable that a stove could be used with profit to heat the building and dry the clothing of the miners, but this has not been tried. Since steam is used intermittently for hoisting, exhaust steam cannot be used to heat the building.

It is not uncommon for operators to equip their boilers with auxiliary injector, steam gage and water gage, so that in case of accident it will not be necessary for the engineer to stop hoisting to repair the damage.

Hoists of various makes and sizes are used, but the most popular is probably the American single-drum friction-type hoist with double horizontal cylinders, built by the American Hoist & Derrick Co., of St. Louis. These engines are roughly made, but they are light, strong and reliable, and will stand a great deal of abuse. Lidgerwood hoists are also much used. The size of the cylinder varies, the most common being 7x9 in., 7x10 and 5½x8 for those with double cylinders. Single-cylinder vertical engines are used by many operators, the 7x7-in. size being especially popular. Smaller hoists with both double and single cylinders are used at many small mines, and larger hoists with double cylinders and two or three drums find extensive application in opencut work.

Patent locked-coil cable, 1-in. diameter, is preferred for the trolley line, and ½- or ⅝-in. flexible steel cable, lang-lay, is used mostly for hoisting. Guys for the ginpole are often made from discarded hoisting cable, as is the trip line and the dumping cable.

FAIRBANKS OVERHEAD CARRIER

Aside from the steam point, the most important contribution of the North to the technology of mining is probably the overhead carrier, developed more or less independently at Fairbanks, Nome and Dawson. Fairbanks, being the younger of the three camps, had the advantage of starting where the others left off, and drift-mining methods are probably more advanced there than at the

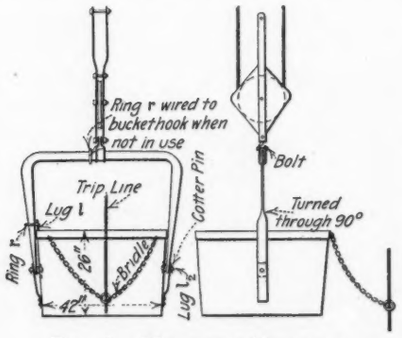


FIG. 2. HOISTING BUCKET, HOOK AND SHEAVE

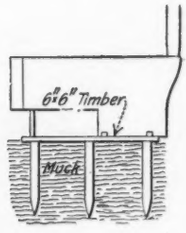


FIG. 4. FOUNDATION FOR BOILER

other camps. There is thus undoubted basis for the belief of the miners of Fairbanks that their particular carrier is the best. There are two makes, similar in principle but slightly different in construction, in use at Fairbanks, of which the more satisfactory is shown in Fig. 1.

When the bucket arrives at the top of the shaft, bolt 11 attached to the extended frame of the bucket sheave, shown in more detail in Fig. 2, is guided by the framework of the carrier against tumbler 1, which is in the position shown by the light dotted lines. The tumbler turns until it is stopped by bolt 9 in the cutout portion 8. The pull on the hoisting cable is then transferred directly to carrier and acts in the direction of the ginpole. The carrier is held in position only by 2, which hooks over the lug on the "hammer," as shown by the light broken lines. This pull, combined with the tension of the spring (not shown) and the unbalanced weight of the extra-heavy tip of 2, and with the jar of the bucket, as its upward motion is abruptly stopped, causes 2 to drop into the position

shown by the heavy black lines. Bar 3, pivoted to 2, is forced forward by the rotation of 2 and, being held from moving up or down by bolts 4, prevents 1 from turning down and releasing the bucket. The bucket moves up the trolley cable, dumps as shown in Fig. 3, and returns by gravity to its position over the shaft. The point of 2 engages the hammer and throws 2 into the locked position, drawing back 3, which frees 1 and permits it to turn, dropping the bucket down the shaft.

The whole operation takes place in the space of a few seconds, as many as 60 buckets having been hoisted from a depth of 60 ft. and dumped in the space of 30 min.—an average of 30 sec. for a round trip, including the time of loading and dumping. At the same plant one engineer averaged more than a bucket a minute for 9 hr.

Carrier Bucket

The type of bucket used in connection with the Fairbanks carrier is illustrated in Figs. 2 and 3. They are made of sheet iron of different weights, to hold from 2 to 8 wheelbarrow loads of gravel. An 8-wheelbarrow bucket has a capacity of about 27 cu.ft. The best practice

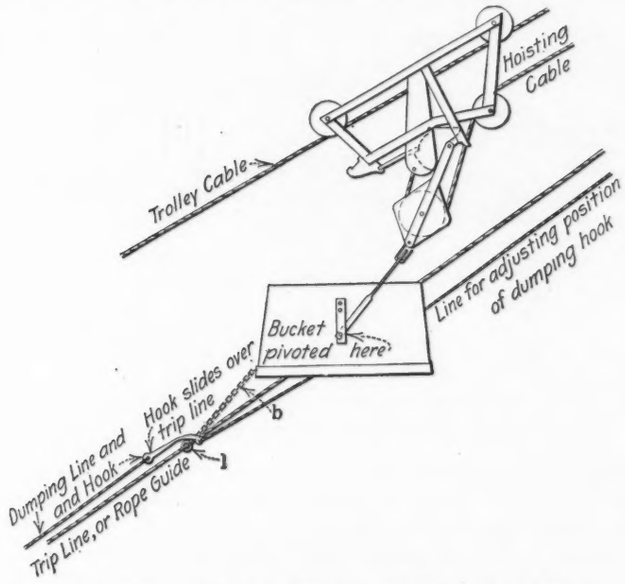


Fig. 3. Position of Bucket and Carrier When Discharging

is to load only 7 wheelbarrows in an 8-wheelbarrow bucket, to avoid danger from rocks dropping off in case the bucket swings against the cribbing, as often happens with rapid hoisting. On the left side of the bucket will be noted a lug over which slides a ring on the bail, thus preventing the bucket from turning when men or tools are being raised or lowered. This ring, when not in use, is attached to the bucket hook by means of a small wire.

Most operators, in timbered shafts of moderate depth, use a single-trip line and bridle as illustrated; but for deep shafts without timbers, where the bucket has more room to swing, double-trip lines and two bridles are used, one for each fore corner of the bucket. Fig. 3 shows the bucket in the act of dumping. The ring in the bridle engages some obstruction placed on the trip line, pulls the forward side of the bucket under, and spills the load. No strain from dumping comes on the trip line, the auxiliary dumping cable taking the entire load.

Since the surface is usually of muck, which thaws readily under pressure if a little heat is present, the matter of foundation for boiler and hoist is important. Long mudsills and cross-timbers are much used, but these may give trouble with heavy boilers. Short skids of sawed 6x6-in. timbers are usually bolted to lugs on the boiler, as shown in Fig. 4, and the rear end of the boiler is sometimes supported by placing lagging crosswise under them. Owing to the greater heat at the forward end of the boiler and the greater weight of the firebox and smokestack, the front end is more difficult to support. Probably the best way is to thaw vertical holes in the muck 6 or 8 ft. deep by means of steam points or plain pipe, and in these holes place posts on which rest the boiler skids, either directly, as shown in Fig. 4, or through the medium of cross-timbers placed on the posts. If this work is done during cold weather, or if the holes are deep enough, the thawed muck remaining in the holes around the posts soon freezes

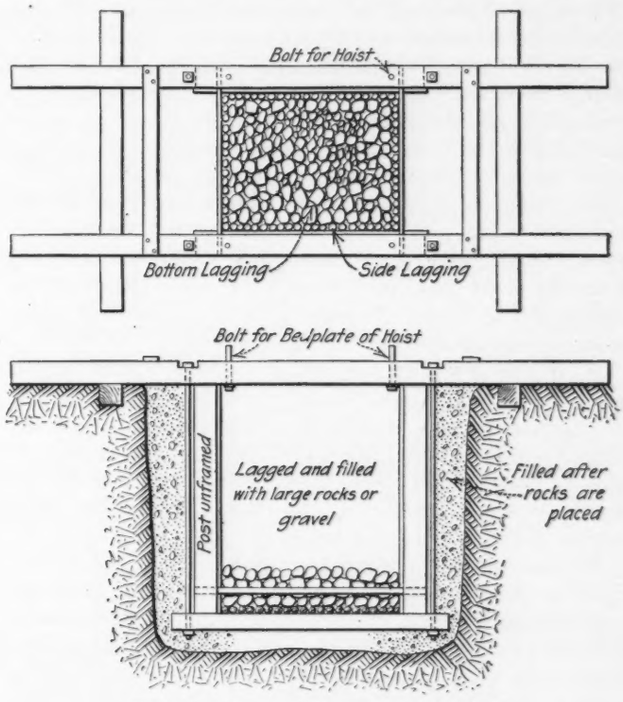


Fig. 5. Foundation for Hoist

again and holds the posts as firmly as if they were planted in a bed of concrete.

Another method of supporting the boiler—particularly applicable to low places where there is considerable surface water—consists in placing two layers of long poles on the ground at right angles and one above the other, and covering these with several feet of gravel. The gravel soon packs so firmly that the whole mass acts as a unit, supporting the boiler without difficulty and absorbing much of the vibration of the hoist. In the infrequent cases where gravel comes clear to the surface, light skids under the boiler are all that is required.

Hoist Foundations

The foundation for the hoist is usually obtained by sinking four posts in the muck as described above and bolting the hoist to heavy timbers placed on the posts and fastened to them by drift bolts. For small hoists, and where it is not desired to run at high speed a simpler foundation may be used, consisting of long timbers laid

in trenches and tamped with gravel, with suitable cross-timbers. Another foundation is illustrated in Fig. 5. It consists essentially of a sort of box tied together with long bolts and filled with gravel to give weight and absorb the vibrations of the hoist. This support is particularly advantageous where gravel extends to the surface.

While considering the subject of power, it may be well to note that 4-ft. wood is used exclusively as fuel. There was formerly an abundant supply of birch and spruce on the hills in the mining area, but this has largely been exhausted, and in recent years it has become necessary to go farther and farther afield, with the result that wood now costs the operator from $7 to $15 a cord, depending on the situation of the mine with regard to the source of supply. The stumpage charged by the Government is at the rate of 25 cents a cord; cutting costs about $3.50 a cord; the rest is the cost of transportation. Seasoned 4-ft. split birch is the best wood, but 16-ft. spruce is more widely used. In cutting spruce the custom is to set fire to a patch of green timber when conditions are such that there is little danger of the fire spreading too far. This burns off most of the limbs and kills the tree without doing the trunk appreciable damage. The wood is cut into 16-ft. lengths after it has had time to season and is hauled over the snow to the mines, as much as five or six cords being taken at a single load. As a general rule, other things being equal, it is more economical for the operator to buy 4-ft. wood than to buy the 16-ft. length, even though there is a considerable difference in price, since the short wood piles more closely and has a smaller proportion of voids. It takes about four cords of 16-ft. wood to make three cords of the 4-ft. size.

A circular saw is an essential part of every plant, and is used for cutting wood, cribbing and for other purposes. The saw is placed outside the main building, but may have a shed roof for protection from rain and snow. It may be driven from the flywheel of the hoist if a vertical engine is used for hoisting, or from a separate vertical engine if the hoist cannot be used.

For the sake of sending tools to and from the surface and for general convenience, the boiler house is placed near the shaft, as shown in Fig. 6, which illustrates in a general way the layout of the entire surface plant. The blacksmith shop and work-bench are usually in the same room as the boiler and hoist, although this makes it difficult to keep the machinery clean.

The most important part of the boiler house, especially if it is intended for winter use, is the roof, since careless construction causes constant sweating in cold weather. To obviate this difficulty, tar paper is laid on a roof of 1x10-in. boards and battened down; or, more commonly, galvanized or painted corrugated iron is placed directly on the paper or on strips to hold it off the paper and thus give a more satisfactory air space. The rest of the boiler house is constructed as simply and as cheaply as possible, since it is rarely intended to be used more than one or two seasons before being torn down and removed to another site. Some operators make portions of the building, especially the sides, in sections that can be removed or replaced in a moment.

Ginpole and Headframe

The ginpole is placed at such distance from the shaft and in such situation as to leave ample room for dumping waste without interfering with other operations and to permit the sluice-boxes to be at sufficient elevation to provide room for the disposal of tailings. A simple and efficient method of raising a ginpole was described in a recent issue of *Power* and is illustrated in Fig. 7, which is self-explanatory. By hammering the foot-block with a heavy ram the pole can be shifted at any time in case the cable does not wind properly on the drum of the hoist. Fig. 6 shows the relation of guys and the trolley cable to the rest of the surface equipment. "Deadmen" for anchors may be prepared in the usual manner by digging trenches, or by thawing oblique holes in the muck and driving in posts, much as is done in making foundations for boilers and hoists. Stumps of trees are sometimes used for anchors, but these are unreliable, since the frost in the ground keeps the roots from penetrating deeply enough to get a firm hold. The headframe is simply made and is of the type shown in Fig. 8. It is not called on to bear heavy strains and is never a source of trouble.

The muck through which the shaft passes may be removed by picking, by blasting or by thawing. In blasting, the holes are usually thawed by steam, one being in each corner and one in the center. By using more holes the charge of powder may be correspondingly decreased. Since the muck is very brittle, a high explosive is used

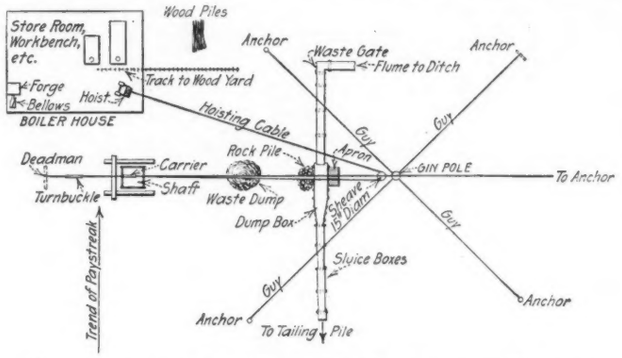


Fig. 6. Layout of Surface Plant at a Typical Fairbanks Placer Mine

to give a shattering effect. If the shaft is to be timbered, as it must be if used in summer, the muck is often thawed by steam and the hole "squared up" to the proper size by picking. The gravel is always thawed by steam points and unthawed protuberances are removed by blasting or by means of warm water under a slight pressure from the boiler or from a siphon or injector.

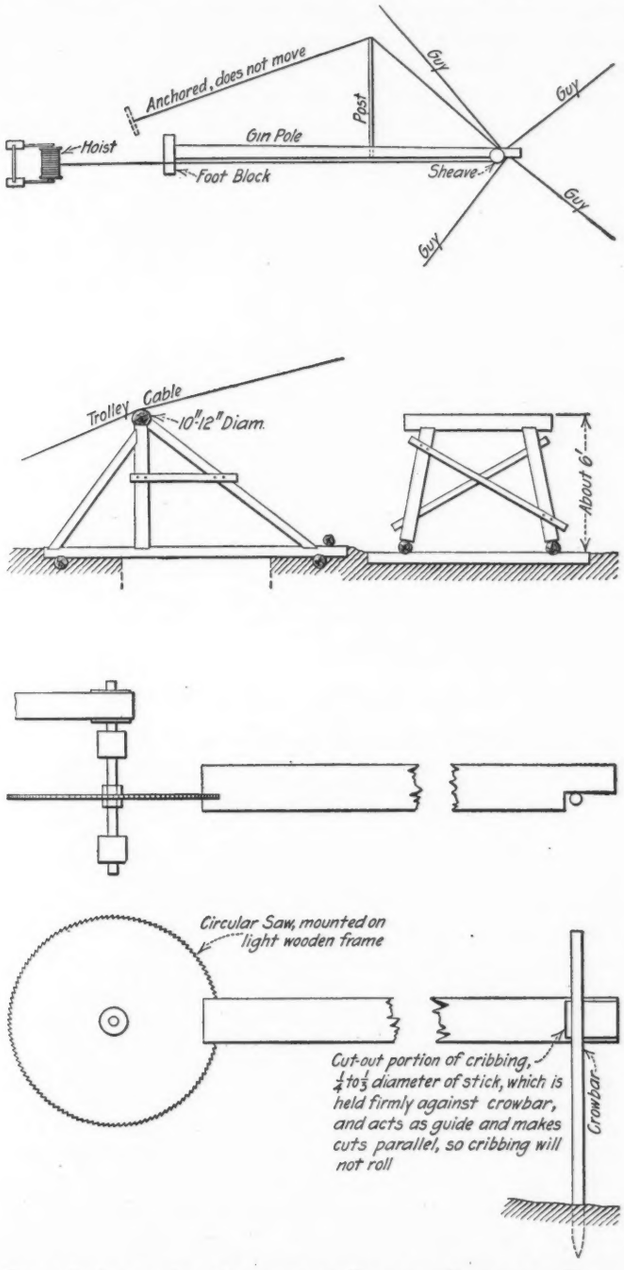
The usual practice is to sink the shaft to bedrock, cut the sump and the station, put in the square set, and then proceed with the rest of the development work. It is difficult and dangerous to timber a shaft at a temperature of 30° or 40° below zero, and there is absolutely no need for timber until spring comes, so shaft timbering is almost always left until warm weather permits the work being done more easily and in less time.

Most working shafts at Fairbanks are 6 to 7 ft. square in the clear, and all are timbered with round-pole cribbing 3 to 6 in. in diameter, cut from 16-ft. wood and notched by circular saw as shown in Fig. 9. A station set, or "square set," is shown in Fig. 10, together with the cribbing immediately above. The space between the timbers and the frozen gravel is filled with gravel, or moss may be used to advantage through the muck near the surface, either of which must be tamped firmly into place. In timbering a sort of cage, Fig. 11, is used at some mines.

The timbers are kept plumb by means of lines suspended in the corners. Timbering may be done from the bucket instead of from the cage, but the bucket is so much smaller than the shaft that it swings too freely, making the work disagreeable and dangerous.

Cribbing the Shaft

With a gang of skilled workmen cribbing can be carried up very rapidly. In one case on Vault Creek, where the



Figs. 7, 8 and 9. Method of Raising Ginpole. Fairbanks Type of Headframe. Cutting Cribbing with Circular Saw

mine inspector ordered that the shaft be timbered or the mine closed, and where great haste was necessary on account of the coming of spring, 180 ft. of cribbing was placed in five days by five men. About 1500 pieces of cribbing were required. The manner of cutting the cribbing is illustrated in Fig. 9. The chief difficulty is in making the two longitudinal cuts on the ends parallel, and this is done by means of a vertical guide. One piece is cut out, as shown, the pole is reversed and the other cut is made, the smooth face of the cut-out portion being held firmly against the guide. If there is sufficient room in the shaft to insert the cribbing without crowding, the "toe" is cut fairly long to prevent the ends sliding off each other in case the timbering "corkscrews."

Muck is easily held, owing to the slowness with which it thaws; but gravel is the bugbear of the shaft timberman. It thaws readily for a variable distance from the shaft and when thawed occupies appreciably less space than when frozen. Consequently it settles, and the filling, no matter how firmly it is tamped, also settles, especially if there is a little water seeping down from the surface. Since the cribbing is held in place only by the surrounding gravel, it also tends to shift, more or less unevenly, the consequence of which is that the shaft takes on a corkscrew aspect, and the individual poles, if small, are likely to ride over each other, or "jack-knife." Anchors can be used in muck to hold the timbers in place, but these are worse than useless in gravel, since the anchor notches are soon included in the thawed area and settle with the rest. The anchors, being longer than the other timbers, do not settle evenly with them and thus aggravate

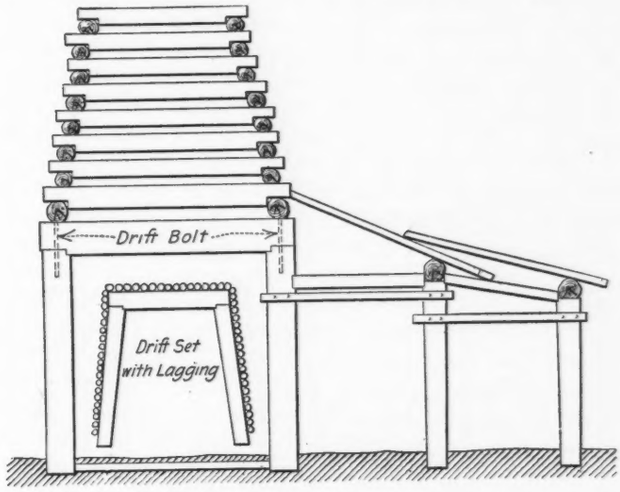


Fig. 10. Station Timbering

the tendency of the shaft to get out of line. In a shaft passing through 60 or 70 ft. of gravel the top cribbing may settle several feet in a month or two on the coming of warm weather, in which case more cribbing is added from time to time to keep the top level with the surface.

Cribbing larger than 6 in. in diameter or smaller than 3 in. is rarely used. The direct pressure is comparatively insignificant, no instance being known to the writer where the shaft caved because of the breaking of sound timbers. Small poles, owing to the smaller hold they take on each other, corkscrew and jack-knife much more readily than large poles, and are not used where there is a good supply of the larger sizes. In general, since it is rarely desired to work from one shaft more than a year or two, it may be said that where proper precautions are taken little trouble is experienced with this part of the mine.

Steam line and water line are carried in one corner of the shaft and the bell cord in another. The steam line is usually inclosed in a box or is wrapped with some insulating material to avoid loss from condensation and to avoid

unnecessary thawing of the gravel around the shaft. The size of the steam line varies, but is usually 1 in. or 1¼ in. The smaller sizes are to be preferred where they are capable of delivering all the steam required, since their smaller area gives less loss from condensation. Some shafts are equipped with ladders, which invariably run directly to the surface without intermediate platforms; but these are a nuisance except where there is only one night man, whose duty it is to fire the boiler and regulate the points, necessitating occasional trips underground. There is always danger when hoisting is in progress that the swinging of the bucket will knock someone off the ladder or that a rock will become dislodged from the bucket or from the cribbing, so in many shafts no ladders are found. Even in traveling back and forth in the bucket great care is exercised, the laborers being cautioned to bend forward over the bail and never to look up, so that if they are struck by falling rocks they will stay in the bucket.

Working the Paystreak

If the paystreak is very wide, say 150 ft. or more, tunnels are usually driven in four directions from the shaft (see *a*, Fig. 12). The usual practice, however, is to drive upstream and downstream, possibly driving incidental prospect tunnels at right angles to the trend of the paystreak, as shown at *b*. The latter method, for the sake of simplicity, will be described in detail.

The length of paystreak to be worked from a single shaft is rarely more than 400 ft.—200 ft. each way from the shaft. If mining is carried on at a greater distance from the shaft the item of underground transportation raises mining costs to such a figure that it is cheaper to sink a new shaft and move the surface equipment. This is true whether cars or wheelbarrows are used. With wheelbarrows each shoveler runs out his own dirt. If working 200 ft. along the tunnel from the shaft he has about a 250-ft. trip from the face, or 500 ft. a round trip. If handling 100 wheelbarrows a day (and at many mines the duty is from 120 to 150), he must trundle his barrow 50,000 ft. a day, or nearly 10 miles, besides picking and shoveling the gravel. If cars are used it takes so long to make a trip that the shovelers often have to wait on the carman.

Bedrock grade is another factor that militates against long tunnels, especially downstream. It is aimed to sink the sump at the shaft deep enough to drain all the workings by gravity, a small duplex pump being used intermittently to raise the water to the surface. The tunnels must, therefore, have sufficient grade to carry the water from the face. With bedrock falling and the tunnel bottom rising, there is obviously a limit to the practicable length of tunnel possible without making the sump so deep and starting the drifts so low in bedrock as to greatly interfere with working the ground adjacent to the shaft. Tunnels have been driven long distances entirely in bedrock, but this has the grave disadvantage of failing to prospect the ground, and several failures have resulted from getting off an irregular paystreak or running into an unsuspected low-grade area.

Some operators drive large tunnels and put in heavy timbers as they proceed; others drive small tunnels and use small timbers and just as few of them as possible. With ground that holds up well it is possible to get along with little timber, but where each rock drops from the roof as it thaws, or the gravel thaws a few inches and then comes down in bunches, timbers are necessary for efficient work.

Timbering in the Drifts

Three-piece sets are used to timber drifts and mudsills are added where bedrock is too soft and mushy to give good footing for the posts. Sprags or spreaders are also sometimes placed between the bottoms of the posts to prevent crowding inward from lateral pressure. The timbers are not required to be of great size, since they have to bear the weight only of such gravel as thaws around the tunnel from the heat of the steam line and the escaped steam from thawing operations. Round timbers 6 to 15 in. in diameter are used, the medium sizes finding the widest application. Sets are placed 5 to 8 ft. apart and lagged with round poles of 2 to 5 in. diameter. The size of drift varies, but 4x6½ ft. in the clear is probably a fair average. Details are shown in Fig. 10. Swelling bedrock, which gave considerable trouble in portions of the Dawson district, is rarely found at Fairbanks, owing to the permanently frozen condition of bedrock and gravel. Where mining is attempted in thawed ground, however, it is likely to cause much difficulty.

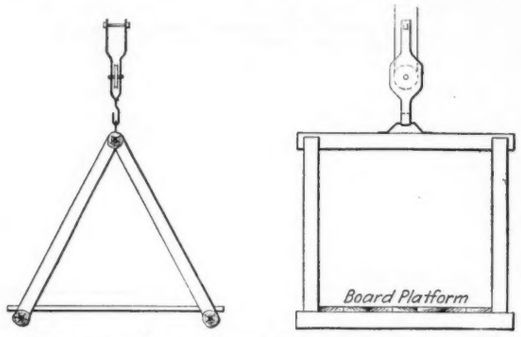


Fig. 11. Cage Used in Timbering Shaft

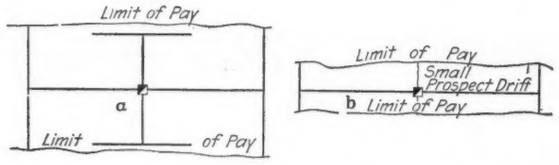


Fig. 12. Tunnels Driven to Open Wide and Narrow Paystreaks

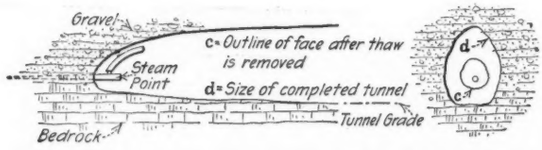


Fig. 13-a. Driving Tunnel with Single Steam Point

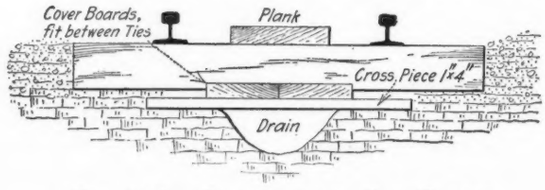


Fig. 13-b. Drain under Car Track

In driving tunnels for immediate timbering from two to four steam points are used, and sufficient gravel is

thawed to insert the timbers at once. A more economical method, where conditions will permit its application, is that used by E. M. Keys, the Chatanika operator. One 8-ft. point is driven near the top of bedrock, where driving is easiest, and steam is turned on for 10 hr. or more, depending on the character of the gravel and the readiness with which it thaws. When the thawed gravel is removed this leaves a round bore just large enough for a man to work in, say 3½ ft. in diameter at the forward and smaller end. The thawed material having been removed, the point is driven into the new face and steam is turned on. The hot water draining away from the face thaws the bottom of the preceding section and enough steam escapes, especially in driving, to thaw some of the roof. This is removed, or as much of it as desired, before the new thaw is taken out. By such successive enlargements the tunnel may be increased to any size, but it is usually kept as small as possible and the roof arched to obviate the need of timbers. The method is illustrated in Fig. 13. The drift is run with uneven grade, the idea being to get to the end as soon as possible. One man, with an assistant to wheel away the gravel, makes an advance of 8 ft. per day, driving his point for the next thaw and shoveling the gravel into the wheelbarrow. Tunnels are usually driven in four directions from the shaft at Chatanika, where the method is used most, and one wheeler is thus enabled to serve several shovelers. After the tunnel has been driven and the grade of bedrock accurately determined, bedrock is taken up where necessary and the tunnel made of even grade throughout its length, resistant hummocks being removed by blasting. A few sets of timbers are placed next the shaft and at such other points as needed.

Transportation Problems

Drifts made in this manner are just large enough for the cars, it being necessary in many cases for one desiring to pass a car to climb over it. While this is a very cheap and economical method where the gravel stands well enough to make its use possible, it is inapplicable to most of the ground of the Fairbanks district, since the gravel usually falls from the roof as fast as it thaws, cluttering up the track or wheeling plank and rendering timber necessary. When used great care is essential in driving points and in thawing to prevent the escape of more steam than is absolutely necessary.

Some operators dig a small ditch for drainage at the side of the wheeling plank or car track, as the case may be, but this has a fatal tendency to become clogged periodically, and the better practice is to put a covered drain under the runway, as illustrated in Fig. 13*a*. Short cover boards that will fit between the ties are used. They can thus be taken up and the ditch cleaned out without disturbing the track.

The main tunnels having been driven along the center of the paystreak, crosscuts or lateral drifts are turned off at the ends and run to the limits of the pay. The procedure is much the same as outlined above, but the drifts are made smaller and are not timbered. They serve as the starting point for stoping, which is carried toward the shaft from both directions in order that the laborers may never have to work under the unsupported roof.

The problem of transportation must be given due consideration in opening up a block of ground. There are three possible methods of moving the material from the face to the shaft—by wheelbarrow, by car, or by the use of both. Wheelbarrows were formerly used entirely, but they have now been replaced at the larger mines by cars. The use of wheelbarrows permits a more flexible system, requires less capital outlay and less expense for development, and is still popular at many of the smaller mines where paystreaks are narrow and irregular and the pay uncertain. In preparing for wheeling, the tunnels may be driven smaller than when intended for cars, and are driven about as deep in bedrock as pay extends. Two-inch planks, 10 or 12 in. wide, are used for the "runway"; and owing to the grinding of small rocks on these under the wheels they wear out rapidly and require frequent replacing.

Where cars are used it is necessary to drive the main tunnels with fairly even grade and to avoid sharp turns. Right-angle turns are necessary in going from the tunnels into the crosscuts, and heavy sheet-iron turnplates are placed there. The carmen become so skillful that they make these turns on the run without a second's delay.

When cars are used in conjunction with wheelbarrows the gravel is shoveled into the latter at the face, wheeled to the main tunnel and dumped into the waiting car. The main tunnels must be deeper in bedrock than the crosscuts to permit dumping without wheeling up a steep grade.

Which one of the last two systems—cars alone or wheelbarrows with cars—is to be preferred depends largely on the character of the bedrock surface and the notions of the operator; frequently both are used at different faces in the same mine. It is usually considered best to shovel directly into the cars, but where bedrock rises rapidly upstream this may not be possible without giving the tunnel a prohibitive grade. Similarly, bedrock may fall so rapidly downstream that it is not feasible to dump the wheelbarrows into the cars without driving that portion of the tunnel next the shaft too deep in bedrock for economical handling of the upstream gravel and of that next the shaft.

Fuller's Earth Production in 1914

The production of fuller's earth in the United States in 1914 amounted to 40,981 tons, an increase of 2387 tons over 1913, while imports increased by 6349 tons. Florida produces about 75% of the American output, according to the U. S. Geological Survey.

Fuller's earth is used in this country principally in bleaching, clarifying or filtering fats, greases and oils; it is not now much employed for fulling cloth, the use from which it obtained its name. It is also used in the manufacture of pigments for printing wall papers, for the detection of certain coloring matters in some food products, and as a substitute for talcum powder. The common practice with mineral oils is to dry the earth carefully, after which it is ground to suitable sizes and run into long cylinders, through which the crude mineral oils are allowed to percolate slowly. As a result, the oil that first comes out is perfectly water white and much thinner than that which follows. The oil is allowed to continue percolating through the earth until the color reaches a certain maximum shade.

With the vegetable oils the process is radically different. The oil is heated in large tanks beyond the boiling point of water; from 5 to 10 per cent. of its weight of

fuller's earth is then added; and the mixture is vigorously stirred and then filtered off through bag filters. The coloring matter remains with the earth, the filtered oil being of a pale straw color.

Lawsuit Revives Recollections of Romantic Mining Enterprise in the Butte Camp

BUTTE CORRESPONDENCE

The intensely prosaic methods with which stupendous enterprises were launched in the Butte camp almost every day without arousing so much as a ripple of admiration or astonishment among the natives were pleasantly interrupted one day by the appearance in the Butte field of one Captain O'Hara from the Emerald Isles. A picturesque character was O'Hara, and he took it into his head to instill into the matter-of-fact methods of the Butte camp some of the romance of the past and to turn into a regular gala day the launching of an enterprise of his own. This was nothing less than the starting of a huge gold dredge which was to dig fabulous wealth out of thousands of acres of placer ground, situated near Rocker in the western section of the Butte district. O'Hara had acquired this with the aid of British capital that flowed freely into his hands upon the assurance that, Midas-like, whatever he touched he would turn into gold.

Invitations were issued to all the notables of the state and the country at large to witness the starting of the dredge. The general public was also invited. Stockholders and others who had no interest beyond a natural curiosity flocked to Rocker on a special train to see the thing go. The then governor, Edwin Norris, came over from Helena to make a speech from the captain's bridge of the dredge. The promoter's stenographer—later his wife—broke a bottle of champagne over the stately head of the dredge to the strains of a brass band which was engaged to bring joy and gladness to the hearts of all those present. Then there was lunch, and as the sun sank behind the distant hills everything had assumed a golden hue and those less familiar with Butte's ore deposits were lulled by the magnificence of the occasion into dreams of another Klondike at the very doors of Butte.

Then came disaster, and then the sheriff. A week or two of dredging operations failed to disclose the presence of placer gold. The huge buckets of the dredge, one by one poured forth upon the gold tables mud and water with ceaseless regularity, but never a glimmer of gold. It was discouraging. For there was no market for mud or water. The operations were discontinued and O'Hara with his bride betook himself to more promising fields of operation.

For years the huge dredge which was installed at a cost of more than $50,000 stood on the same spot on which it was baptized, a monument of folly. On Feb. 13—note the ominous number—of the year 1915 a judgment for $7500 was issued against the British-Butte Company, owner of the dredge. As the judgment was not satisfied, the dredge was ordered sold at sheriff's sale 10 days later. At this sale Deputy County Attorney Melzner of Silver Bow County bid $1000 for the dredge and got it. Then W. E. Ward, the representative of the British-Butte Company, came rushing to Butte on a 5000-mile trip from South America to dismantle the dredge with the apparent intention of selling it for scrap material. Thereupon Melzner, the present dredge-master, applied to the courts for an order to restrain Ward and his cohorts from tearing the dredge to pieces. The injunction was granted May 19, under which Ward is temporarily prevented from interfering with the property until a hearing is had on the question of a permanent injunction.

Thus the famous gold-digger who was ushered under such glorious auspices into the everyday routine life of the Butte camp has at last turned into a sordid trouble-digger, the end of which is not yet, as both parties to the contention are determined to fight to the bitter end for the possession of the beloved dredge—or what is left of it.

Status of French Metallurgical Companies

The status of the large French metallurgical companies is thus summed up in *Commerce Reports*, May 18, 1915: The great Schneider Works (Creusot), one of the largest manufacturers of artillery in the world, has all of its various establishments, except its iron-ore mine in the Meurthe et Moselle, in full operation. The Société de la Basse Loire at Trignae is well provided with orders for steel for war purposes and for rails for the railway companies. La Société Metallurgique de l'Ariège, which owns plants for making shells, only slackened up a few days after the mobilization and is now running at full capacity.

The Hauts Fourneaux de Caen is somewhat handicapped by the delay in the erection of its new furnaces caused by the lack of labor and building materials. La Société Française des Metaux, the Trefileries du Havre, and L'Electro Metallurgique de Dives are all in full operation. In addition to those cited in the foregoing, other steel and iron plants in the south and center of France are working at their full capacity, almost exclusively on orders from the government.

Portland Cement Production in 1914

The production of portland cement in the United States in 1914 was 88,230,170 bbl., as compared with 92,097,131 bbl. in 1913, according to advance figures furnished by the U. S. Geological Survey. Shipments were 86,437,956 bbl. in 1914 and 88,689,377 bbl. in 1913, so that stocks on hand increased during 1914 from 11,220,328 to 12,893,863 bbl., while the average yearly price fell from $1.005 to $0.927. Of the total production, 24,614,933 bbl. were made in the Lehigh district and 11,532,605 bbl. in Illinois and northwestern Indiana.

The Metcalf Incline

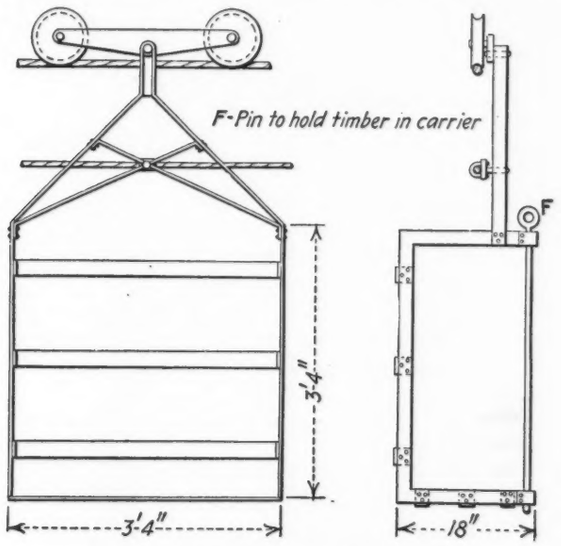
In "Photographs from the Field" in the JOURNAL of Apr. 10, 1915, p. 633, we published what was erroneously described as a view of the Arizona Copper Mining Co.'s incline at Metcalf. It was, in fact, one of the old Shannon inclines at the same place. In order to give an entirely clear record, illustrations are given in this week's "Photographs from the Field" of the Arizona Copper company's inclines at the same point.

Details of Practical Mining

Timber Carriers for Aerial Tram

By Frederick W. Foote*

When the original carriers on a 4-mile double-rope type gravity aërial tram had to be replaced new carriers as shown in the accompanying sketch were fabricated in the mine shops. The carriage and wheels were the same as those used for the tram buckets. The framework was built up of ⅜x2½-in. strap iron, bent and riveted together as shown. The pins *F* are removable and used to keep the timber from falling out. Other things, such as barrels, etc., are lashed in with a lash rope. These carriers face toward the outside, so that they may be loaded and unloaded with the greatest facility. In loading timber and rails care must be taken to lash only at one point in the middle of each carrier, so that when mounting the



Timber Carrier for Aërial Tram

cable to pass a tower the load can pivot and thus overcome the vertical displacement. Should the timber be lashed at both ends of the carrier the lever action is such that the traction wheels are lifted off the traction cable on passing a tower, and much trouble is caused thereby, sometimes even pulling down the tower over which the load is passing.

The Negative Wire

It is often desirable to know which is the positive and which is the negative wire in an electrical circuit when no instruments are at hand to make the test. A simple method, given in *Power*, June 1, is to put the ends of the wires into a cup of water containing a little salt, acid or sal-ammoniac. The wire around which the most bubbles are seen is the negative.

*University, Va.

Efficiencies of Mine Pumps

By P. E. Barbour

The development of the multistage centrifugal pump has put a new competitor into the field of mine pumping and has in a way complicated the problem of choosing a pump for that particular kind of a service. When reciprocating pumps only were used there was little chance for argument, except as to the relative merits of similar pumps. The centrifugal pump underground requires a motor, and this means bringing power into the mine by electrical conductors instead of by steampipe. Consequently, when comparing the efficiencies of the units to be installed, one should always consider the over-all, or wire to water efficiency. This, of course, is less than the mechanical efficiency of the pump itself, and its consideration emphasizes a fact which was not often enough given serious thought before this particular phase of the question made it so prominent a consideration.

Air-Lifts

The air-lift pump is often advocated for mine use because of its extreme simplicity, and having in mind the many difficulties always incident to operating underground pumps, it is said of the air-lift that all you have to do is to stick the pipe in the water and turn on air and you will get water delivered. This statement is correct, *if* the pipes are properly proportioned, *if* the air jet is sufficiently broken up at the point of delivery and *if* the submergence is in proper proportion. On account of the fact that the length of pipe submerged has to be such a large proportion of the total length of the lift, the use of this pump is precluded for unwatering a shaft to the bottom, except under most extraordinary conditions which can rarely be attained except at disproportionate cost and inconvenience.

Under anything like ordinary good conditions, the air-lift never achieves a greater mechanical efficiency than about 40%, and no mechanically operated pump of decent construction falls so low as this.

In the table is given the efficiency of an air-lift pump, *A*, under actual test, and under unusually favorable conditions, as to submergence, head and quantities handled. At a submergence of 75% this pump reaches its maximum efficiency of 37.7%. If we multiply this by 0.80, a fair average value for the efficiency of the air compressor, we get an ultimate over-all efficiency for this air-lift of 30.16%.

Except under most unusual conditions, the air-lift should never be considered as a part of a permanent installation in mine pumping.

The Cornish Pump

The Cornish pump is a very efficient pump when properly installed, but when improperly installed is a source of very great trouble, inconvenience and expense for maintenance. This type of pump is not so popular as

formerly and is ordinarily not a competitor with reciprocating and centrifugal pumps. The Cornish pump *C* in the table was described in the JOURNAL of May 15, 1915, p. 858.

RECIPROCATING PUMPS

A standard type of reciprocating pump will generally have a higher mechanical and over-all efficiency than a centrifugal pump when used against the heads usual in mine practice. In the table, *D* and *E* show this type of pump by two different manufacturers. The guaranteed efficiency of pump *D*, 90 to 92%, is high, but it represents a specialized type of pump. However, to attain this high degree of pumping efficiency involves construction including a considerable number of valves, etc., and it is probable that the maintenance cost of this pump, especially on mine water, which is rarely clear and free from grit, would be a very considerable factor. The pump *E* was a guaranteed pump and was an actual proposition made for the drainage of a Utah mine, and it is interesting to note that after due consideration was given to all details a multistage centrifugal pump was installed instead of a reciprocating type.

CENTRIFUGAL PUMP

Pump *B* is mentioned in the table to show the high efficiency of the single-stage centrifugal pump operating under the favorable conditions for which it was originally

PUMP EFFICIENCIES

		Efficiency in Per Cent.		Capacity in Gal. per	Head in	
		Pump Alone	Overall	Min.	Feet	Remark
A	Air lift (City Wells, Hattiesburg, Miss.) (a)	37.7	30.16	1,100	37	Test
B	Single-stage centrifugal (Mont Belvieu, Tex.) (b)	87.8	80.79	45,760	43	Test
C	Cornish (Chapin, Minn.) (c)	.....	88.6	1,922	1513	Test
D	Plunger (Epping-Carpenter) (d)	90–92	80.1	1,000	800	Guarantee
E	Plunger (Cent.-Eureka) (e)	80.0	70.6	500	1690	Guarantee
F	Multistage centrifugal (Cent.-Eureka) (e)	65.0	58.7	500	1680	Guarantee
G	Multistage centrifugal (Cent.-Eureka) (e)	72.0	64.0	1,000	1680	Guarantee
H	Multistage Centrifugal (Roodepoort, Transvaal) (f)	62.0	57.0	375	2490	Guarantee
I	Multistage centrifugal (Roodepoort, Transvaal) (f)	65.0	59.8	449	2520	Test
J	Multistage centrifugal (Roodepoort, Transvaal) (f)	63.4	58.3	406.5	2549	Test
K	Multistage centrifugal (Chapin, Minn.) (c)	.....	72.0	3,000	965	Test

(a) Ivens' Pumping by Compressed Air.
(b) Engineering News, Apr. 1, 1915, p. 648.
(c) Engineering and Mining Journal., May 15, 1915, p. 858.
(d) Coal Age, May 1, 1915, p. 763.
(e) Engineering and Mining Journal, May 9, 1914, p. 957.
(f) Journal of South African Institute of Engineers, Jan., 1915.

designed—large volume and low head. This pump was used on an irrigation scheme, and was driven by a direct-connected, horizontal, cross-compound, four-valve steam engine.

The pumps *H*, *I* and *J* are centrifugals operating satisfactorily in the Roodepoort mine in the Transvaal, *H* being the builder's guarantee and *I* and *J* the actual pumps furnished. When the installation of these pumps was considered the advantages and disadvantages of both reciprocating and centrifugal pumps were carefully compared. And it was decided that although the efficiency of the reciprocating pump was greater than that of the centrifugal under the circumstances, the cost of installation and, more particularly, the cost of maintenance were so much in favor of the centrifugal that that type was installed. After a year's operation, comparisons of operating and maintenance costs with both centrifugal and reciprocating pumps in the same mine showed that the judgment was justified and the advantages in this case were actually in favor of the centrifugal pump.

Pump *K* is a multistage centrifugal pump at the Chapin mine in Minnesota and was described in the JOURNAL of May 15, p. 857.

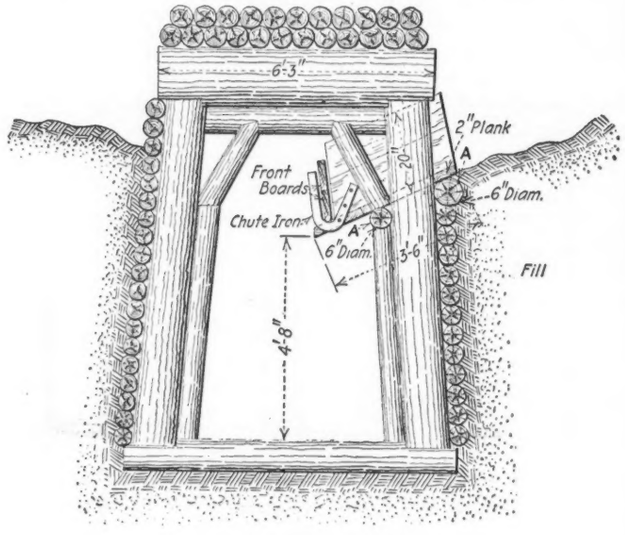
In the table, pumps *F* to *J* inclusive are multistage centrifugal pumps of foreign manufacture, while pump *K* is a United States pump. It will be noted that the efficiency of the home product is considerably higher than that of the foreign-made pumps, but it is only fair to call attention also to the fact that it is a much larger pump in the first place and that secondly it is operating under a much less head than any of the others.

For conditions to which the centrifugal pump is adapted it is probable that its efficiency will be nearly as high as that of the displacement pump for the same condition and its maintenance cost will be considerably less.

A Simple, Strong Chute

BY H. H. HODGKINSON*

The chute here described is substantial, capable of ready removal and easily operated. The drift sets are placed so that they are alternately 3 ft. and 4 ft. apart center to



A SIMPLE, STRONG CHUTE

center. The chutes are constructed on alternate sides in the spaces between the sets, which are 4 ft. apart. This facilitates the removal of the muck from the stope above and gives much more space in the set timbers in operating the chutes.

The chutes are constructed of 2-in. planks, which are held in place by ½x4-in. lagscrews. The cross-pieces *A A* are fastened to the posts by ½x8-in. lagscrews. The use of lagscrews instead of spikes permits the removal of the chutes without damage and the recovery of the lagscrews themselves.

The front boards are of 2-in. planks about 5 ft. long, although the chute is only 30 in. wide inside. These boards are held by chute irons, which are made of ⅝x2-in. straps bent in the shape shown, bolted to the side planks

*Mining engineer, Franklin Furnace, N. J.

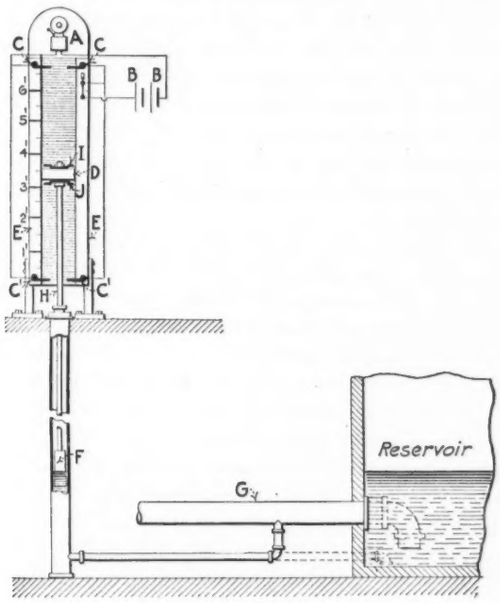
by means of ½x3-in. machine bolts and fastened by ½x ½-in. lagscrews to the bottom planks.

Lagging is placed behind the set timbers as shown, and behind this the fill is placed to a height of 7½ ft., but sloping down toward the chutes at about the same angle as the chute bottoms. Fill or waste supports the sets better than the ore, since it packs tighter and is much lighter to handle.

Water-Tank Indicating Gage

For installations where the tank is situated on about the same level as the observer, the indicating gage described by Thomas K. Lee* in *Power,* June 1, has given satisfaction.

On a 1x6-in. board, the length of which corresponds to the depth of the reservoir, fasten two pieces of 2-in. maple flooring *E* with their grooves facing each other. A block *D,* to slide freely in the grooves, is fastened to a light rod *H,* and on the end of this rod is a float *F*. A 3-in. pipe is used for the float to work in, and this extends down to the level of the bottom of the reservoir. A ½-in. pipe connects the 3-in. pipe to the suction pipe *G* (or to the bottom of the reservoir itself) and maintains the same water



Indicator and Alarm

level in the 3-in. pipe as that in the reservoir. To the block *D* are fastened springs *I* and *J,* and to the top and bottom of the board are fastened contacts *C* and *C'*. At the top a bell is placed connected to batteries *B*. The gage is graduated in feet and inches and is so marked that the reading corresponds with the height of water in the reservoir.

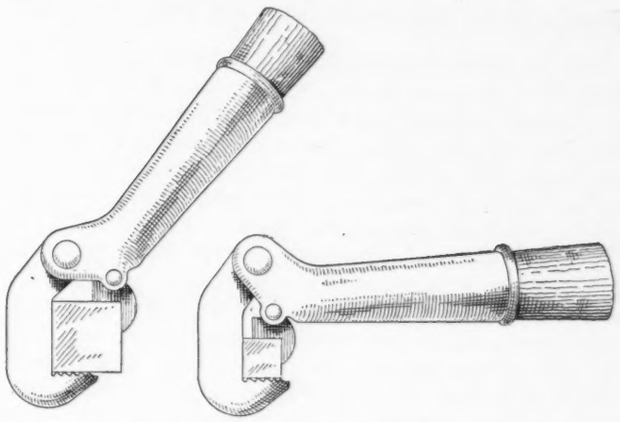
When the reservoir is full, the spring *I* on the block makes contact with *C* at the top, completing the circuit and ringing the bell, and at the bottom a similar contact is made when the water is low. The wiring is concealed behind the gage board, and a switch can be used to cut out the bell.

The gage is located in the most convenient place and wired so that the bell may be placed where the operators are most likely to hear it.

*Benson, Minn.

Dumping Hopper Cars

The dumping of hopper cars at mills and smelteries is not infrequently accompanied by some danger and is usually accompanied by considerable trouble and discomfort. A new wrench for operating the dumping doors of these hopper cars has been put on the market by the Stephens-Adamson Manufacturing Co., of Aurora, Ill., which



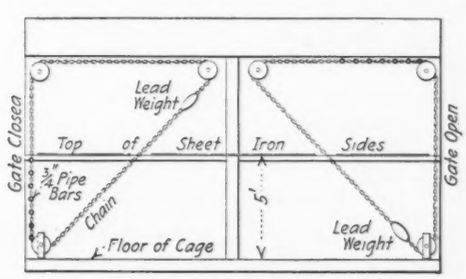
Self-Adjusting Car Wrench

offers many advantages over the old type generally used and removes some of the danger coincident with this job. This wrench, as shown in the illustration, protects the operator by its instantaneous self-releasing action when the door falls. The jaws are so constructed that the harder the pull on the lever the tighter is the grip on the squared end of the shaft. It would seem as though this wrench had a fertile field in the mining and smelting industry.

Sliding Chain Gates on a Cage

By F. H. Armstrong*

For a safe yet easily handled gate for a cage, bars of ¾-in. pipe fastened to two chains are used. The chains run over pulleys set at the corners of a triangle, as shown in the accompanying drawing. On the hypotenuse of the triangle is a lead counterbalance to offset the weight of



Chain Gates for Cage

the bars. When the gate is open, the bars are on the horizontal part of the chain along the roof of the cage and the weight is near the bottom of the cage. When the bars are down—gate closed—the weight is near the top of the cage. This appliance is simple, reliable and easily operated.

*Mechanical engineer, Vulcan, Mich.

Details of Milling and Smelting

Furnace Operation at Mt. Lyell

Some interesting details of the later practice at Mt. Lyell, Tasmania, were given by Robert C. Sticht during his visit in America. At the December meeting of the New York Section of the American Institute of Mining Engineers Mr. Sticht, in responding to numerous inquiries, touched upon many points of furnace operation not previously covered in such detail.

The furnaces used at present are 210 in. long, 54 ft. wide and about 18 ft. high, the limitations in regard to height being largely that imposed by the furnace building. From 1200 to 1300 long tons are smelted per day in a little more than two furnaces, the capacity of the works exceeding that of the mines. When smelting was begun at Mt. Lyell the metallurgist had a nearly pure pyrite ore and used barren quartzite and sandstone for siliceous flux. The gangue matter in the Mt. Lyell ore at that time amounted to only 8%. It has since gone up to 12 or 14%, and as the Mt. Lyell ores have grown poorer, the more siliceous North Lyell ore, carrying about 6% copper, has been substituted, so that now, with the Mt. Lyell pyrites averaging about 0.5%, the furnace charge averages from 2.15 to 2.25% Cu, and from this a 45 to 50% matte is obtained in one smelting.

The Mt. Lyell ore instead of having 42 to 44% of iron now has only 35%, and while the coke on charge was as low as 0.1% for a six months' period at one time, it now ranges from 3.5 to 5%. The composition of the slag has likewise altered; instead of running 30 to 32% SiO_2 it now goes 36 to 38%, and the iron instead of being 52% FeO is now 45%. The limestone on the charge is not varied, and hence the lime in the slag changes but little. Alumina amounts to about 7%. The copper content ranges from 0.35 to 0.45%, in a high-concentration smelting of about 20 : 1. Mr. Sticht remarked that while this copper content in the slag might be a little higher than it would be in the double-smelting process, the management has not yet assured itself that it really is. The slag stream runs over forehearths for 50 to 60 ft. before it is discarded into the granulating launder, and a little matte is caught in each compartment.

Siliceous Skeleton the Groundwork of the Blowing-In Charge

In answer to a question by Arthur S. Dwight in regard to the method of blowing in the blast furnaces at Mt. Lyell, Mr. Sticht stated that instead of the usual fusible blowing-in charge, such as is used in ordinary smelting, only siliceous material is added to the fuel at the start. After the usual bed of fuel for heating and ignition purposes, several loads of quartz are put in up to about where the focus begins—perhaps a layer of quartz 4 or 5 ft. high—and then on top of this siliceous "skeleton" regular charges are started immediately.

The charges contain about 10% of fines (smaller than ½ in.), but at times may be nearly 100% fines. On account of this and other local conditions some classification is made of the ore as it comes from the mines. Coarse ore is thus available when the furnace charge requires correction. The materials to be smelted are brought to the furnaces by hand in charging carts, and are emptied out of the end of the carts in a long string on the charging plate close to the edge of the furnace opening. The coke is brought first and pushed in. Then all the iron pyrites is dumped and shoved into the furnace, the siliceous ore is put in on top of it, then limestone and finally slag, flue dust and cleanings.

Feeding is done from both sides of the furnace, and it is absolutely necessary to have the greatest elasticity in the delivery of the materials to it. The success in attaining a high-concentration ratio and avoiding double smelting depends on this elasticity in the delivery of materials and the proper feeding of the furnace. Conveying appliances from bins to furnaces cannot do what the feeders have to do—use judgment in the selection and placing of the materials at the furnace. The question of charging and feeding has been exhaustively studied, and it is not considered that the work would be either cheapened or improved by substituting mechanical delivery and charging for the trained wheelers and feeders. A self-dumping charge car was tried for a long period, but finally proved to be a mistake.

The only mechanical device used in feeding is an "iron man," which pushes the materials off the inner edge of the charging plate into the furnace. With increased blast pressure the work of feeding became so hot that it was necessary to increase the number of feeders, and so the iron man was invented. This consists of a framework embracing each long side of the furnace. It slides and rolls on the charging plates in such a manner that a line of hinged pusher plates in front and parallel to the whole length of the charge opening simply shoves the material over the furnace edge, the same as the feeder's shovel used to do. The charges or any ingredient thereof may be placed wherever desired in the furnace by having the wheelers dump it at the spot indicated. Thus blowholes or unequal descent of the top may be promptly attended to.

The inner edge of the charging plates projects into the furnace with a certain overhang. This distance was the subject of much discussion, 9, 10 and 15 in. being advocated. It was decided to use a movable charging plate to meet the conditions. Generally speaking, it does seem necessary to let the charge fall 10 in. from the wall. The relative distribution of coarse and fine ore on top of the column depends on the height of drop and the amount of overhang of the charging plates. The practice at Mt. Lyell, modified by many conditions, is to feed so that the center line of the furnace is porous and the blast does not come up prominently on the jacket, but rises out of the column evenly.

In feeding the furnace no attempt is made to break up large pieces unless it happens to be a piece of schisty ore which is broken on the charging plate; otherwise anything a man can lift or that will go through an ore gate is fed

into the furnace. Flue dust is still watered and returned to the furnaces, although other methods of disposition and preparation have been considered, but found too expensive or inexpedient for other reasons.

No Furnace-Charge Calculations Made

The charges are not calculated, as the calculation is of no special use for immediate running purposes, since the furnaces have to be manipulated according to the grade of matte which falls. This is tested at intervals by the furnace foremen, who have been taught to make a quick, rough determination by the cyanide method. The quantities of pyrites and of limestone are kept constant on the charge. The siliceous ore and coke are varied as required, but the variation is mainly in the amount of siliceous ore used. When the matte is below grade, more siliceous ore is put on. This is speaking generally.

The coke is fed evenly along the length of the furnace, but is not distributed over the whole surface of the charge, the aim being to get it on the walls of the furnace. The coke used is made by the Mt. Lyell company at its Port Kembla works in New South Wales. It arrives at the smelting works in Tasmania containing at least 10% water and 16% ash. It is hard and dense, however, and while it does not get down to the focus of the furnace it serves the purpose of heating the upper portion of the charge. A very low coke percentage was achieved during the hot-blast régime when it was for periods as low as 0.1%. One ton of Mt. Lyell pyrites was then charged with as little as 500 lb. of quartz, or else concentrated first matte, so that there was a superabundance of iron and sulphur as compared with present conditions, which require from 3.5 to 5% of coke.

The tuyeres are methodically punched several times a day and should show no fire. Bright tuyeres are avoided. A light in a tuyere means that some matte is pocketed in that vicinity and when this tuyere is punched the matte is likely to run out into the tuyere box, even though the tuyere is inclined inward. The tuyeres on the Mt. Lyell furnaces are not circular, but long and oval, like a wide mouth, thus approximating a continuous tuyere opening all along the furnace sides. The old tuyere connections are retained, although no valves are placed on the tuyere pipe and no elaborate peek holes are provided, simply a wooden plug in the tuyere box, which of course has a slag escape in the bottom.

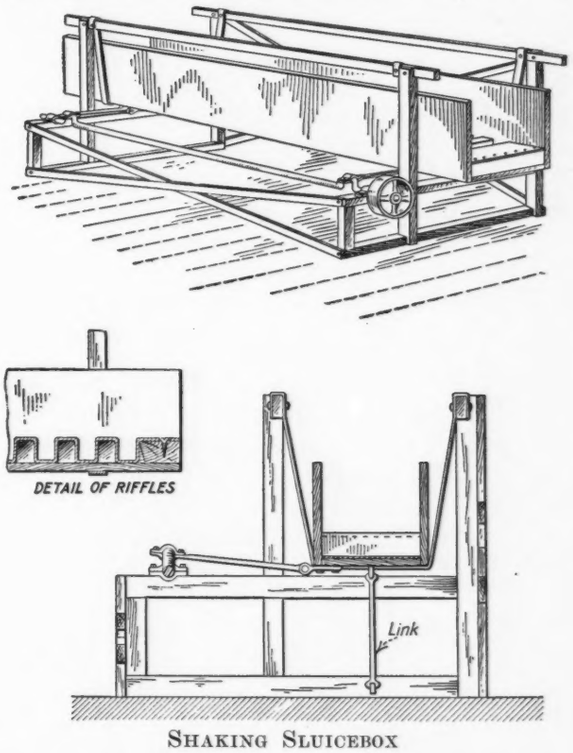
The 17½-ft. furnaces receive 20,000 cu.ft. of air per minute at about 64-oz. pressure. The blowers are run at practically constant speed. When the furnace pressure increases abruptly, the furnace has usually grown too tight and would eventually come to an automatic stop after slowing up, accompanied by an excessively high matte, up to 60 or even 70% in copper. To prevent this, the furnace is loosened up with coarse ore instead of with slag charges, as would perhaps be the case in ordinary smelting.

The introduction of turbo-blowers has permitted an increase in the height of the ore column without scaffolding difficulties. With little blast, too high a column tends to scaffolding. The height of the column has gradually been increased to about 18 ft. At present the company is arranging for facilities to increase the blast pressure by means of multistage turbo-blowers, so that a maximum pressure of 8 lb. may be obtained if desired. There appears to be little change in the bessemerizing action in the high column, provided sufficient air pressure is maintained. The height of the ore column is regarded as a question to be decided between the sticking quality of the ore charged and the blowing machinery. It is considered that in the matter of height of the ore column finality has not yet been reached.

The furnace campaigns, which used to be short, are now six months or more in length, and are usually ended by water getting inside the furnace from leaky jackets or because a forehearth may need repairs. Difficulties with excess of silica which would not scorify were formerly experienced, but these "silica sows"—not true sows, by the way—are now more rare. Ordinarily from 95 to 96% of the iron is oxidized, and the oxygen efficiency of the furnace is placed at 100%. At least, Mr. Sticht said, 2 or 3% of oxygen does not escape, as has been suggested.

A Concentrating Sluicebox

A new sluicebox designed to assist in separating the fines from broken or granular material and to recover gold has been devised by Henry W. Fry, of California. The box (U. S. pat. 1,117,828) is hung in a timber framework and is arranged to receive a rocking motion from a crankshaft by means of connecting-rods. The bottom of the box contains sheet-metal riffles bent into form. All of these details are clearly shown in the accompanying illustration.



Shaking Sluicebox

In the operation of the box, the ore is fed into it along with a supply of water. Power is then applied to the shaft, causing the box to rock. A link connected with the bottom of the box causes the latter to swing from its center upon an arc of which the link is the radius, thus giving the box, as it is rocked, a slightly curved motion, and assisting in the settling of the fines, or concentrates.

The construction and use of this device are made evident through a study of the drawing.

The Cost of Doing Things

Milling Costs at the Goldfield Consolidated Plant

The report of the Goldfield Consolidated Mines Co. for the year ended Dec. 31, 1914, is exceptionally full of detail and shows the amount of supplies used, their costs and the percentage each bears to the total cost. These details are of considerable interest to the operating engineer and for that reason are reproduced here at length.

During the year the property produced 338,192 tons of ore, of which 332,750 tons, of an average gross value of $12.57, was milled and 5442 tons, of an average gross value of $29.01, was shipped. The gross value of this tonnage was $4,340,787. Deducting metallurgical losses, smelter discounts and the cost of tonnage purchased, an aggregate of $414,438, it is found that the value realized from the year's operations was $3,926,349. The expenses of the year, including mining, milling, transportation, construction, taxation and general expenses, were $2,091,-

DETAILS OF MILLING EXPENSE

Year Ended Dec. 31, 1914

Item	Quantity	Price per Unit	Total Cost	Quantity per Ton	Cost per Ton	Pct. Total Cost
Cyanide	623,713 lb.	$0.17105	$106,688.43	1.87 lb.	$0.321	19.99
Zinc dust	152,455 lb.	.08417	12,831.92	.46 lb.	.039	2.43
Lime	4,920,210 lb.	.00733	36,297.02	14.79 lb.	.109	6.79
Lead acetate	280,994 lb.	.09161	25,740.53	.84 lb.	.077	4.79
Muriatic acid	70,040 lb.	.04891	3,411.82	.21 lb.	.010	.62
Water, gal	76,837,267 gal.	.2238	17,197.83	230.92 gal.	.052	3.24
Belting	.....	.....	4,910.32	.....	.015	.93
Lubrication	.....	.....	2,473.62	.....	.007	.44
Borax	19,890 lb.	.1205	2,396.36	.06 lb.	.007	.44
Litharge	43,368 lb.	.07499	3,252.10	.13 lb.	.010	.62
Pig lead	15,390 lb.	.0637	979.57	.05 lb.	.003	.19
Shoes and dies	160,033 lb.	.04904	7,848.11	.48 lb.	.024	1.50
Pebbles	1,761,210 lb.	.01653	29,115.73	5.29 lb.	.088	5.48
Tube-mill linings	88,513 lb.	.0568	5,031.13	.27 lb.	.015	.93
Chilean steel	134,338 lb.	.06057	8,136.38	.40 lb.	.024	1.50
Machinery and repairs	.....	.....	4,143.64	.....	.012	.75
Screens	.....	.....	1,509.64	.....	.005	.31
Office supplies	.....	.....	611.95	.....	.002	.12
Filter cloth	.....	.....	2,436.36	.....	.007	.44
Iron and steel	.....	.....	2,039.13	.....	.006	.37
Assaying	.....	.....	5,860.14	.....	.018	1.12
Hose and fittings	.....	.....	426.81	.....	.001	.06
Pipe and fittings	.....	.....	746.40	.....	.002	.12
Lumber	.....	.....	925.71	.....	.003	.19
Crusher parts	.....	.....	2,303.45	.....	.007	.44
Coal	64 tons	15.46	989.23	.39 lb.	.003	.19
Coke	164,700 lb.	.00726	1,196.39	.49 lb.	.004	.25
Slag	53,586 lb.	.00751	402.21	.16 lb.	.001	.06
Pump parts	.....	.....	1,442.89	.....	.004	.25
Waste	5,639 lb.	.1175	662.29	.02 lb.	.002	.12
Electrical operation and repair	.....	.....	4,734.89	.....	.014	.87
General stores	.....	.....	5,046.05	.....	.015	.93
Fuel oil	422 bbl.	1.64	691.70	.001 bbl.	.002	.12
Total supplies	.....	.....	$302,512.75		$0.909	56.60
Operating labor	19,491 shifts	4.585	89,358.57	.059	.269	16.75
Repair labor	5,984 shifts	4.594	27,490.30	.018	.082	5.11
Power	1,599 hp.	72.00	115,153.95	1.780	.346	21.54
Totals			$534,515.57		$1.606	100.00

DETAILS OF CONCENTRATES-TREATMENT EXPENSE

Year Ended Dec. 31, 1914

Item	Quantity	Price per Unit	Total Cost	Quantity per Ton Concentrate	Cost per Ton Concentrate	Pct. Total Cost
Cyanide	124,870 lb.	$0.17105	$21,409.12	5.70 lb.	$0.979	21.59
Zinc dust	16,940 lb.	.08417	1,428.20	.84 lb.	.071	1.57
Lime	660,000 lb.	.00733	5,000.40	30.47 lb.	.231	5.10
Lead acetate	13,820 lb.	.09161	1,268.57	.68 lb.	.063	1.39
Water	33,627,365 gal.	.2045	6,879.00	1498.68 gal.	.307	6.77
Fuel oil	6,490 bbl.	1.64	10,642.83	12.14 gal.	.474	10.45
Sulphuric acid	273,600 lb.	.02410	6,594.03	12.19 lb.	.294	6.48
Muriatic acid	3,151 lb.	.04891	153.13	.14 lb.	.007	.15
Assaying	.....	.....	1,341.23	.....	.066	1.45
Roaster parts	.....	.....	1,029.80	.....	.046	1.02
Machinery and repairs	.....	.....	394.12	.....	.019	.42
Belting	.....	.....	393.77	.....	.019	.42
Lubrication	.....	.....	28.58	.....	.001	.02
Borax	2,209 lb.	.1205	266.24	.11 lb.	.013	.29
Litharge	4,699 lb.	.07499	352.39	.23 lb.	.017	.38
Coke	18,300 lb.	.00726	132.94	.90 lb.	.007	.15
Pig lead	1,720 lb.	.0637	109.96	.08 lb.	.005	.11
Slag	5,854 lb.	.00751	43.64	.29 lb.	.002	.04
Filter cloth	.....	.....	619.23	.....	.031	.68
Pipe and fittings	.....	.....	297.77	.....	.013	.29
General stores	.....	.....	1,107.29	.....	.052	1.15
Pump parts	.....	.....	482.69	.....	.023	.51
Total supplies			$59,974.93		$2.740	60.43
Operating labor	4,260 shifts	4.318	18,393.09	.198	.855	18.86
Repair labor	470 shifts	4.504	2,116.98	.019	.098	2.16
Power	257 hp.	72.00	18,317.33	4.040 hp.	.841	18.55
			*$98,802.33		$4.534	100.00

* During 1914 the production of concentrates was 20,256 tons; all of these concentrates, together with 2182 tons from reserve dump, were treated. The cost of treating 2182 tons from dump was $7608.22, which is included in foregoing total.

125, leaving a net realization from operation of $1,835,224.

Milling costs rose slightly during the summer, when a large percentage of dump ore was being treated. The cost per ton for treatment of concentrates was lower, thereby reducing total milling costs 9c. per ton.

The equipment for rehandling mill tailings is now practically complete, and will be available when needed. Its cost, which is up to date $91,672, amounts to slightly less than 5c. per ton for the tailings now available for retreatment; and in view of the low operating expense which will result from its use, it is believed that this initial expenditure will be fully justified. The accompanying tables show in detail the milling and concentrates-treatment costs which make this company report a contribution to technical literature.

GOLDFIELD CONSOLIDATED MILLING COSTS

Per Ton of Ore Milled During Year Ended Dec. 31, 1914

Department	Labor	Supplies	Power	Total	Pct. Total
Crushing and conveying	$0.020	$0.018	$0.008	$0.046	2.87
Stamping	.028	.030	.066	.124	7.72
Chilian Milling	.020	.036	.047	.103	6.41
Elevating and classifying	.010	.004	.006	.020	1.25
Tube milling	.022	.109	.111	.242	15.07
Concentration	.029	.007	.016	.052	3.24
Neutralizing	.006	.055	.....	.061	3.80
Settling	.014	.055	.....	.069	4.30
Dissolution	.019	.406	.036	.461	28.70
Filtering	.032	.016	.014	.062	3.86
Tailings expense	.002	.....	.....	.002	.12
Assaying	.002	.017	.....	.019	1.18
Precipitation	.007	.043	.012	.062	3.86
Refining	.018	.028	.....	.046	2.87
Water	.....	.052	.....	.052	3.24
Surface and plant	.003	.002	.....	.005	.31
Steam heating	.....	.001	.....	.001	.06
Storehouse and office	.010	.003	.....	.013	.81
Stable	.001	.001	.....	.002	.12
Watchmen	.022	.....	.....	.022	1.37
Superintendence and foremen	.045	.....	.....	.045	2.80
Lighting	.002	.001	.015	.018	1.12
General expense	.002	.005	.....	.007	.44
Mill tools	.001	.002	.....	.003	.19
Electrical department	.004	.014	.....	.018	1.12
Pumping battery water	.008	.002	.015	.025	1.56
Experimental	.001	.001	.....	.002	.12
Cleanup	.023	.001	.....	.024	1.49
Totals	$0.351	$0.909	$0.346	$1.606	100.00
Per cent. of total cost of milling	21.86	56.60	21.54	100.00	
Per cent. of combined cost of milling and concentrates treatment	18.44	47.77	18.18	84.39	

CONCENTRATES-TREATMENT COSTS

Per Ton of Concentrates Treated During Year Ended Dec. 31, 1914

Department	Labor	Supplies	Power	Total	Pct. Total
Raw cyanidation	$0.080	$0.416	$0.199	$0.695	15.33
Filtering and conveying	.250	.049	.046	.345	7.61
Roasting	.256	.528	.124	.908	20.03
Acid treatment	.073	.323	.240	.636	14.03
Cyanidation of roasted product	.072	.874	.198	1.144	25.23
Assaying	.014	.064	.....	.078	1.72
Precipitation of copper	.068	.015	.....	.083	1.83
Precipitation	.012	.081	.022	.115	2.54
Refining	.033	.051	.....	.084	1.85
Disposal of tailings	.027	.013	.010	.050	1.10
General expense	.010	.016	.....	.026	0.57
Handling dump	.058	.003	.002	.063	1.39
Water	.....	.307	.....	.307	6.77
Totals per ton of concentrates	$0.953	$2.740	$0.841	$4.534	100.00
Totals per ton of ore	.062	.180	.055	.297	
Per cent. of total cost of concentrates treatment	21.02	60.43	18.55	100.00	
Per cent. of combined cost of milling and concentrates treatment.	3.26	9.46	2.89	15.61	

Surface Prospecting at Nipissing

The following costs are taken from the last annual report of the Nipissing Mines Co., of Cobalt, Ont., and apply to the stripping of soil from the rock formation by means of hydraulicking. During the period the number of acres washed was 95.55 and the average depth of soil removed was 3.43 ft. The cost per acre was $499.47 and the cost per cubic yard of material moved was 9.01c., made up of labor, 4.99c.; power, 3.20c., and supplies, 0.82c. There were 153 set-ups made, 33,768 ft. of 16-in. pipe laid down, 34,540 ft. of pipe taken up, and 18,730 ft. of roads were built. The average pressure at the nozzle was 138 lb., and the pump ran 79% of possible running time.

Incidentally, the results of this prospecting were not so good as expected. The only vein of importance found was what is known as H-52, from the outcrop of which 10,000 oz. of silver in high-grade ore was taken. This vein will be prospected the coming summer.

Regrinding Costs at Winona

The figures given herewith, taken from the 1914 report of the Winona Copper Co., Winona, Mich., give the results of regrinding by Hardinge mills at the company's mill. From May on, owing to a larger output, the power costs were materially lower, regrinding costs being below 15c. per ton.

REGRINDING COSTS AT WINONA

	Total	Cents per Ton Reground	Per Cent.	Units Per Ton Reground
Power @ 1.054c. per kw.-hr.	$8,116.05	13.64	79.22	12.94 kw.-hr.
Labor	384.70	.65	3.75	.....
Supplies:				
Pebbles @ 8c. per lb.	1,237.12	2.08	12.07	2.600 lb.
Silex lining @ 1.436c. per lb.	57.48	.09	.56	.070 lb.
Steel lining @ 5.242c. per lb.	197.40	.33	1.93	.063 lb.
Incidentals	252.91	.43	2.47	.....
Totals	$10,245.66	17.22	100.00	
Tons stamped				123,339.45
Copper by assay from Hardinge mineral				265,518 lb.
Copper from Hardinge mineral per ton stamped				2.1527 lb.
Tons reground				59,500
Copper per ton reground				4.462 lb.
Regrinding cost per lb. of copper obtained				3.859c.
Regrinding cost per ton stamped				8.3069c.

Cost of Constructing a Short Transmission Line

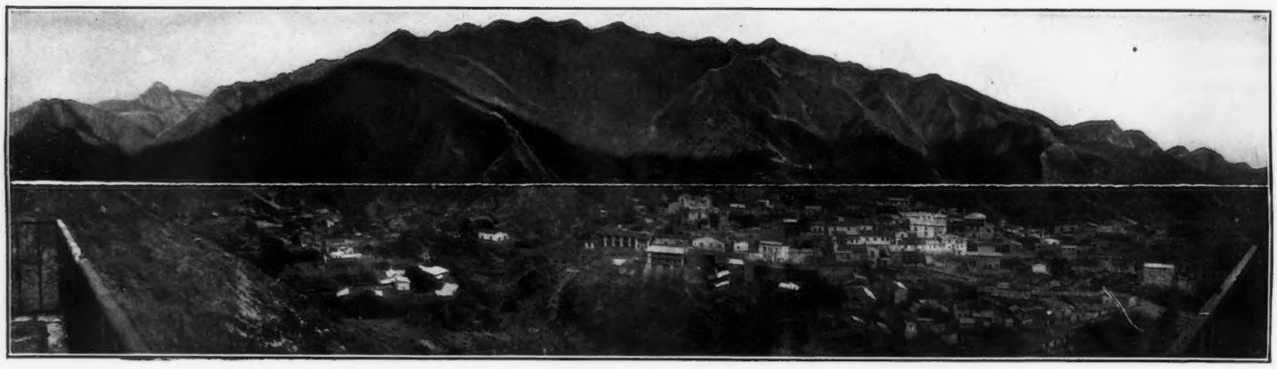
With the extension of central-station service into rural territory the construction expense of moderate voltage transmission lines becomes of interest, says the *Electrical World*. The accompanying cost data are taken from the construction sheets of a Massachusetts central station, which recently built an 11,000-volt single-phase transmission line across a portion of Cape Cod 8.1 miles long, pole location rights being secured from real-estate owners en route:

539 35-ft. poles, at $6	$3,234.00
1204 Victor insulators, at 20c.	240.80
539 pairs braces, at 26c. each	140.14
11,843 lb. bare copper wire, No. 4, at 16.75c.	1,983.70
Carting poles	650.00
130 guys, at $1.14	148.20
424 lb. No. 6 bare wire, at 18c.	76.32
1095 two-pin cross-arms, at 40c.	438.00
2190 1½-in. by 12-in. locust pins, at 4c.	87.60
2 transformer towers	348.00
5 11,000-volt lightning arresters, at $43.50	217.50
2 11,000-volt air-break switches, at $100	200.00
1 2300-volt oil switch	89.20
Right-of-way	345.00
Freight	183.00
Labor	4,800.00
Total	$13,181.46
Per mile of line	$1,620.00

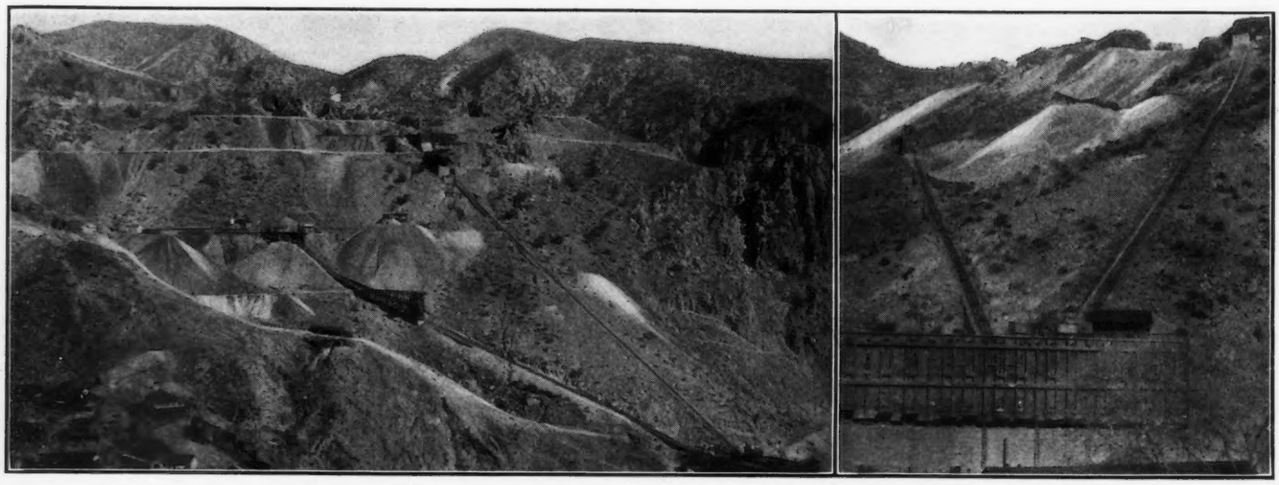
The company obtained the permits for running the wires and also for the pole locations, the erection work being by contract. The contractor trimmed all poles, which averaged 125 ft. in spacing. Poles were head-guyed every half-mile, all guys being provided with porcelain insulators, and every twelfth pole was double-armed. Tree trimming was done by the contractor.

The Monarch Pittsburg Mining Co., Tonopah, Nev., reports a balance of $4619 for 1914 after an expenditure of $32,342. Assessments collected during the year amounted to $27,150. There were 1491 ft. of development work performed at a cost of $9.95 per ft. Details of costs show that the average cost of drifts was at $10.90 per ft.; crosscuts, $9.36; winzes, $20.11 and work through caved ground, $7.37 per ft. It is thought that the Murray vein of the Tonopah Extension Co. extends into the Monarch ground.

Photographs from the Field

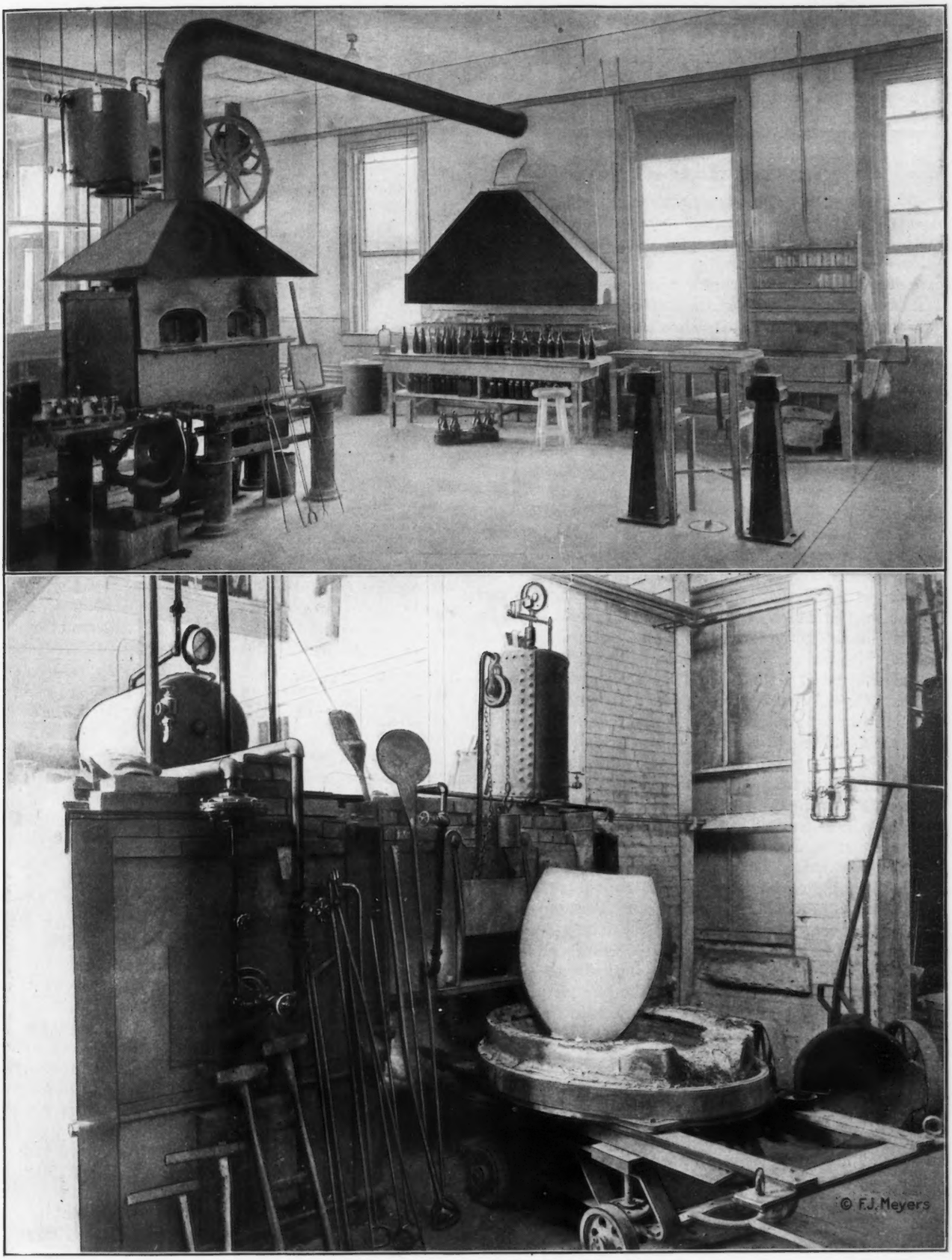


A Panorama of San Dimas, Durango, a Famous Old Mining Center
This is apparently the view referred to by Bill McGinty (see p. 1041)



Arizona Copper Co.'s Metcalf Mine, Metcalf, Ariz.
Showing the Metcalf and Wilson inclines. The former is 1700 ft. and the latter 1200 ft. long

Mining Exhibits from Utah
The left-hand view is a model of the Utah Copper Co.'s mine, complete in every detail. The other is one of the Utah coal mines. They are both in the Utah State pavilion at San Francisco



NEW LABORATORY AND CUPEL FURNACE AT THE HOMESTAKE

The new assay laboratory has been equipped with all the best and most modern appliances. In the lower view a gold bottom, lifted from its bed, is seen standing in the cupel in which it was made. The furnace and tools used are also shown

Correspondence and Discussion

Why Is the Patent Mania?

Referring to Mr. Croasdale's article in the JOURNAL of Apr. 24, 1915, it is true that my position on patent matters differs radically from the opinions expressed in his article. This difference is based rather on personal experience than extended literary investigation.

I cannot agree with Mr. Croasdale that the court investigation should come at the time an application is filed, instead of later; nor can I agree with Mr. Hoover that the Government should, after a stated definite period, protect the patentee; nor can I agree with Mr. Hyde that patent applications should be published.

Wrongfully to withhold a patent from an applicant is quite as great an injustice as wrongfully to grant a patent. What constitutes patentability? Mr. Croasdale is right when he says that I confuse "improvement" with "patentability." Or, rather, a better way to put it would be to say that the dividing line between a patentable improvement and an unpatentable improvement is by no means clearly defined and is no doubt the cause of the greatest amount of patent litigation. The applicant who comes before the patent office and states under oath that he believes himself to be the original, first and sole inventor cannot, without adequate evidence, be accused of being mistaken of being a thief, a liar, or a perjurer.

If a technical court were to pass on all applications, it would necessitate a separate court for each division in the patent office. It is difficult to see why a technical judge who is expert on musical instruments should be any more competent to pass on a complicated electrical application than lawyer-judges are at present on passing on all applications. Then, too, who is to present the evidence? The applicant would doubtless present the evidence for himself, but who would present the evidence for the Government? Certainly the interested party, if the application is allowed. But who is the interested party? Doubtless the one who has the pioneer patent.

Now let us take the flotation patents, mentioned by Mr. Croasdale, and assume one to be the pioneer patent. Should it, then, be incumbent for the pioneer patentee to prosecute at least 140 patent litigations in the patent office to protect his own patent? A greater injustice cannot be imagined, and if he does not take a hand in the litigation, what assurance has he, any more than now, that his interests will be properly protected?

Then, too, what would it cost the Government to adjudicate all applications; what would it cost the applicant to defend his application, and what would it cost the pioneer patentee to protect his patent? All this cost would be chargeable to some one, and the result would be that where it now costs approximately $100 to prosecute an *ex-parte* patent application, including the Government fee of $35, it would probably, under Mr. Croasdale's suggestion, cost several thousand dollars. Every patent would have to be litigated, whether it was worth litigating or not, and no one can say what applications would be worth litigating. Probably some years ago the flotation patents would not have been considered worth litigating, while now they are. My contention is that at the time of applying for a patent few applicants are in a position to judge as to the ultimate worth and scope of the patent if allowed, and it is doubtless for this reason that the courts have given wide interpretations to pioneer patents in any art; and this is as it should be.

It is difficult to see how the Government could protect a patentee after, say, six months, as suggested by Mr. Hoover. For the Government to assume responsibility would be to require thorough investigation and litigation before the patent is issued, and only then could the Government presume to assume responsibility. But such a procedure would be necessary on all patents, and all patent applications would come under its scope. Why put every applicant to this useless litigation, when at the present time a patentee is quite as safe if the courts have passed on the merits of his case? Surely the Government would not assume responsibility, to the extent of giving a guarantee, on the 140 flotation patents, without investigation and litigation of conflicting interests, before the patents are allowed. And after patents are allowed with a Government guarantee, would there be any assurance that the different patents so allowed would never conflict? They doubtless would. Then what would be the position of the Government if two patentees claimed conflicting interests? The only answer is: More litigation.

To publish patent applications would involve the greatest injustice imaginable. How many applicants can define the scope of their invention, its possibilities, and its best method of application at the time the application is filed? Probably none. At the time of filing an application an invention is usually begun, but probably never completed.

The Government requires diligence in patent matters, and priority rests on reduction to practice, and reduction to practice is usually determined by the filing date of the application. If, then, an application is published before the inventor desires to give publicity to his invention, he would have all kinds of interferences to litigate in the Patent Office; and others, taking up the essence of his invention, would so surround him as to make his patent worthless. The premature publication of an application would be a severe blow to the individual and practically put him out of business, while it would be the greatest boon for the large corporate interests and wealthy individuals. The individual would simply go down and out through deliberately enforced Patent-Office interferences, brought about by premature publicity, which is forced on the applicant to maintain his priority. Patent pirates would thrive as never before and no inventor's interests could be regarded as secure in a patent application.

Personally, I feel that the United States patent system is the best in the world, all things considered. This does not mean that it cannot be improved. The improvements that to me seem most essential are:

1. That the term of the patent should be extended for a period of not less than 20 years, and that the time of operativeness should date from the time the application is filed. The applications should not be published.

2. That an alleged infringer, if threatened with litigation by one who claims his inventions were infringed upon, should have the right to initiate litigation. As at present constituted a patentee can threaten litigation indefinitely and never bring action, while the alleged infringer cannot initiate litigation to clear the situation. To threaten litigation for alleged infringment indefinitely, without action, to retard or ruin another's prospects, can only be regarded as blackmailing.

3. That a technical court should be established to hear patent cases, and that litigation should be expedited as much as possible. Only one appeal should be allowed.

Referring to the matter of a working clause in the patent laws, it is true that the present proposed legislation is directed to certain chemical processes. If such a law is passed, either it will be declared unconstitutional as discriminatory legislation or, if upheld, will establish a precedent for all other patents. Then what would happen to the poor inventor, who, with all his other multitudinous troubles, would be continually harassed by expensive litigation to show that his invention was in *bona-fide* operation, when he has not the means to put such operation beyond the shadow of a doubt?

The Government might reserve the right, in order to avoid oppressive monopolies, to say what reasonable compensation should be allowed a patentee by others for the use of his invention, and this might not be a bad idea; but this right should not be exercised unless the Government shall also have the right to fix the price of the products of such inventions. As this practically includes everything manufactured, such an arrangement would be far-reaching in its scope.

WILLIAM E. GREENAWALT.

Denver, Colo., May 5, 1915.

Ancient Gold Mining in East Africa

The historian Diodorus the Sicilian, who wrote about 60 B. C., gives an account of gold mining and milling in Egypt and Ethiopia, which may stand quotation as unfamiliar to most mining men. The JOURNAL'S recent references to slave and captive labor seem to render them pertinent. The following is from Booth's translation (1814) of Diodorus. His account of the sociological conditions under convict labor makes one think of the coal mines in our Southern States.

"We shall now speak a little of those [Ethiopians] inhabiting the southern parts and toward the Red Sea. But it is fit first that we say something of the making of gold in these parts.

"In the confines of Egypt and in the neighboring countries of Arabia and Ethiopia there is a place full of rich gold mines, out of which, with much cost and pains of many laborers, gold is dug. The soil here is naturally black, but in the body of the earth run many white veins, shining with white marble, and glistering with all sorts of other bright metals; out of which laborious mines those appointed overseers cause the gold to be dug up by the labor of a vast multitude of people. For the kings of Egypt condemn to these mines notorious criminals, captives taken in war, persons sometimes falsely accused, or such against whom the king is incensed; and that not only they themselves, but sometimes all their kindred and relations together with them, are sent to work here, both to punish them and by their labor to advance the profit and gain of the king. There are infinite numbers upon these accounts thrust down into these mines, all bound in fetters, where they work continually, without being admitted any rest night or day, and so strictly guarded that there is no possibility or any way left to make an escape. For they set over them barbarians, soldiers of various and strange languages, so that it is not possible to corrupt any of the guard, by discoursing one with another, or by the gaining insinuations of a familiar converse.

"The earth which is hardest and full of gold they soften by putting fire under it, and then work it out with their hands: the rocks thus softened, and made more pliant and yielding, several thousands of profligate wretches break it in pieces with hammers and pickaxes. There is one artist that is overseer of the whole work, who marks out the stone, and shows the laborers the way and manner how he would have it done. Those that are the strongest among them that are appointed to this slavery, provided with sharp iron pickaxes, cleave the marble-shining rock by mere force and strength, and not by art or slight of hand. They undermine not the rock in a direct line, but follow the bright shining vein of the mine.

"They carry lamps fastened to their foreheads to give them light, being otherways in perfect darkness in the various windings and turnings wrought in the mine; and having their bodies appearing sometimes of one color and sometimes of another (according to the nature of the mine where they work) they throw the lumps and pieces of the stone cut out of the rock upon the floor. And thus they are employed continually, without intermission, at the very nod of the overseer or tax-master, who lashes them severely besides. And there are little boys that attend upon the laborers in the mine, and with great labor and toil gather up the lumps and pieces hewed out of the rock as they are cast upon the ground, and carry them forth and lay them upon the bank. Those that are about 30 years of age take a piece of the rock of such a certain quantity, and pound it in a stone mortar with iron pestles till it be as small as a vetch, then those little stones so pounded are taken from them by women and older men, who cast them into mills that stand together there near at hand in a long row, and, two or three of them being employed at one mill, they grind it so long till it be as small as fine meal, according to the pattern given them. No care at all is taken of the bodies of these poor creatures, so that they have not a rag so much as to cover their nakedness, and no man that sees them can choose but must commiserate their sad and miserable condition. For though they are sick, maimed or lame, no rest, no intermission in the least, is allowed them; neither the weakness of old age nor women's infirmities are any plea to excuse them; but all are driven to their work with blows and cudgeling, till at length, overborn with the intolerable weight of their misery, they drop down dead in the midst of their insufferable labors; so that these miserable creatures always expect worse to come than that which they then at present endure, and therefore long for death, as far more desirable than life.

"At length the masters of the work take the stone thus ground to powder, and carry it away in order to the per-

fecting of it. They spread the mineral so ground upon a broad board, somewhat hollow and lying shelving, and, pouring water upon it, rub it and cleanse it, and so all the earthy and drossy part being separated from the rest by the water, it runs off the board, and the gold, by reason of its weight, remains behind. Then washing it several times again, they first rub it lightly with their hands; afterward they draw up the earthy and drossy matter with slender sponges gently applied to the powdered dust, till it be clean pure gold. At last other workmen take it away by weight and measure, and these put it into earthen urns, and, according to the quantity of gold in every urn, they mix it with some lead, grains of salt, a little tin, and barley bran. Then covering every pot close, and carefully daubing them over with clay, they put them in a furnace, where they abide five days and nights together; then, after they have stood to cool a convenient time, nothing of the other matter is to be found in the pots, but only pure refined gold, some little thing diminished in the weight.

"And thus is gold prepared in the borders of Egypt, and perfected and completed with so great toils and vexations. And therefore I cannot but conclude that nature itself teaches us that as gold is got with labor and toil, so it is kept with difficulty, creates everywhere the greatest cares, and the use of it mixed both with pleasure and sorrow.

"Yet the invention of those metals is very ancient, being found out and made use of by the ancient kings."

A. B. COLI.

New York, May 8, 1915.

Bill McGinty, Prospector--IV

Misther Editor—Havin' disposed av the geology av sidimintary volcanics in a satisfact'ry manner, we will now pass on—that is to say, we will now pass over the edge av thim an' luk down. We will also skip gaily past the usual 9000- to 15,000-word ixplanatory chapter on the Ginisis av the ore-dayposits. Some fellies buck on Ginisis theories, an' want to know what has the Bible to do with minin' in Mexico. 'Tis full av it, but I am too busy to tell ye av the Exodus, av Numbers, av Joshuas an' Judges, or the lost Jobs an' the Lamentations. The Acts spake for thimsilves an' so should the Hebrews. 'Tis the Rivilayshuns that int'rest prospectors, an' they always come at the last.

As I was sayin', now an' then ye get a glimpse av the Bacis valley. 'Tis int'restin' to luk down an' see wan ridge after another, with deep gashes in between, knowin' that in each gash there may be dozens or hundreds av veins waitin' to be opened up. Then yer mule stops, an' ye discover a train av freight mules comin' uphill an' wantin' to pass ye. So ye dismiss the Bacis territory for the time bein', as the river av Quien Sabe, which is Mexican for Rio Teodoro. Ye can hear all kinds av tales av rich but lost mines in the in-accessyble headwaters, where the old Spaniards are said to have built trails along the face av cliffs by usin' iron brackets, injinuity, an' Injin slave labor.

By an' by 'twas dark an' we had not arrived annywheres. So we kept on, an' about the time we decided to hunt water an' camp we struck a flat place. In a little while a voice called out av the dark: "How do you do? Come inside the gate. I am pleased to see you an' will have *comida* leady pletty soon. My name is Mar Tom an' I am fl'end of the Glingos." Well, it was fine to see a white man, even if he was a Chinee.

Puentecillas is said to be in the watershed av the Rio Verde; but, like the felly that went through algebry, 'twas night an' we didn't get to see much av the place. We set out early in the mornin' among the clouds, not seein' more than the trail, an' very little av that. It winds around sharp ridges, dips down to cross little torrents, an' then up again. 'Tis difficult to say offhand how much change in illivayshun ye've covered whin ye walk down wan hill an' ride the mule up the next wan. Finally we got on top av wan av Adam's rivers, in a place called Otates, because they grow there as well as in other places. An *otate* is a kind av long reed cane, suitable for fishpoles, ceiling brooms, an' first-aid to window thieves. We rode along through the bushes an' canes for a while, an' all at wance Rodrigo dismounts an' motions ivery wan to do the same. Then he beckons an' whispers: "El Cumbre." A tourist wud ask: "Does it bite?" But the word manes peak av a mountain or, sometimes, greatest height av favor. 'Tis both in this place. To the west ye can see the glorious Pacific Ocean. From there, around to southwest, south, southeast an' east lays a grand bird's-eye pannyrammy, with territory that wud take ye years an' years to begin to explore, not to mention prospectin'. Down in a wrinkle near by lays a little speck; an' when yer eyes get the focus ye begin to see houses. It luks as if ye cud throw a rock down an' hit the blue dome av the little church next to the speck av green which is the orange grove av the Plaza. A ridge which luks tiny compared with all the rest has an illyvayshun av 6000 ft. above sea-level, an' the town av San Dimas (*El Santo Ladrone,* or sainted thief who repented on the cross), in the wrinkle below, it is about 2500 ft. The difference av 3500 ft. is but the depth av a plow furrow as ye luk down from the Cumbre.

From the Cumbre 'twas downhill, zigzag, then along the trail cut out av the face av a cliff, an' down to Carboneras. After lunch by the brook that furnishes water for power at the Guamuchil mill av the Candelaria mine, we zigzagged down to San Dimas itself, in time for the regular Sunday dance an' concert in the Plaza. The Candelaria mine has been a fine producer, an' is well worth fightin' for.

Whin I go back an' take another luk at that cave I'll tell ye all about it.

BILL MCGINTY.

Brooklyn, N. Y., May 22, 1915.

(That's all of this series, anyway.)

More Unemployment

The California press has become excited over a new vacuum smelting process developed by a student at the state university during the preparation of a thesis. This process eliminates sulphur fumes and substitutes oil for coke in the blast furnace—both problems on which the practical smelters have been engaged for years. What are the old men in the field going to do now? And what will the students do after graduation if they solve all these problems before leaving the universities?

FUNDIDOR.

Coram, Calif., June 3, 1915.

Tentative Mine-Safety Rules in California

By Lewis H. Eddy*

The tentative mine-safety rules prepared by a committee of mining men at the request of the California Industrial Accident Commission are here summarized for the benefit of readers who may not have a copy of the complete rules at hand:

These rules shall apply to all mines operated in California except where the chief mine inspector is of the opinion that the enforcement of any rule would not materially increase the safety of the employees or would work an undue hardship on the operator. The exemptions must be in writing to be effective and may be revoked after reasonable notice is given in writing. (Sec. 1.)

Operators must make yearly reports of dangerous conditions to the inspection department, and immediate reports of conditions that may become instantly dangerous. Operators shall designate and appoint persons on whom all notices respecting these rules may be observed. (Sec. 2 and 3.)

Artificial breathing apparatus must be kept at each mine employing more than 30 men underground, and the men must be trained in the use of this apparatus. (Sec. 5.)

Mine maps shall yearly be brought up to date. (Sec. 6.)

Whenever dangerous conditions from any cause designated in these rules shall be found by the inspectors, a notice shall be served in writing upon the operator or his representative. If necessary changes have not been made within the time specified in the notice, the Industrial Accident Commission shall be notified and take such steps as are provided in the Workmen's Compensation, Insurance and Safety Act. All fatal accidents shall be reported by telephone or telegraph, and inspection made by the inspector when necessary. (Sec. 7 and 8.)

Boys working underground shall not be under 16 years. (Sec. 9.)

Appointments of superintendent and mine foreman are provided for, and their duties described in relation to these rules. (Sec. 10, 11 and 12.)

No liquor is allowed underground, or in any building connected with the operation of the mines, except for the purpose of administering to injured persons; no intoxicated person is allowed on the premises. Wages shall not be paid on any premises where liquor is sold. (Sec. 13 and 15.)

Personal accidents to employees must be reported by them to the superintendent or the foreman. Operators must take reasonable precautions to protect employees; dangerous places must be fenced off. Solitary employment is forbidden. Strangers and visitors shall not be permitted underground unless accompanied by officials. Miners shall be made acquainted with the rules applicable to them. (Sec. 14 and 15.)

Miscellaneous rules for underground men are separately set forth covering the following subjects: The use and care of explosives; getting on and off cage, skip or bucket; signaling; riding on loaded skips and tops of cages; closing of gates or bars at stations; dropping of material or tools; necessity for lights underground; reporting dangerous conditions; avoiding danger of loose ore over raise or chute; reporting defects in ladderways and use of danger signals; warning of fellow workmen; familiarity with exits; prohibiting smoking, or lighting lamps or candles when loading holes; care of caps and powder, and return of explosives to proper places; tamping powder in drill holes; blasting of boulders; lights in preparation for blasting; prohibiting the deepening of holes previously charged; lowering of tools in manway; prohibiting the extraction of explosives from missed holes; reporting accidents and injuries; regarding fires in powder magazines; inspection of fuse; use of crimpers only; picking down loose rock; necessary timbering; reporting strained or broken timbers; method of placing and loading holes to save timbers; reporting unusual conditions underground; forbidding short-cut travel through dangerous workings; regarding lights in powder magazine; regarding candle or lamp underground; warnings by bosses or shot firers; counting of number of explosions; use of electricity in firing shots; closing of chutes; guarding chutes to skip pockets; covering holes opening in chutes; removal and replacing of flooring, lagging or timber; replacing of tools on going off shift; seeking refuge when cars approach; placing of refuse in receptacles; prohibiting improper use of electricity; reporting defects, damage or injury to timbering, apparatus and equipment; forbidding fighting and wrestling; removing exposed spikes or nails; regulating the spitting of fuses; regulating the placing of steel, timber and other material, and drilling machines; keeping lights on moving cars; careful handling of cars. (Sec. 16.)

Abandoned shafts and openings must be fenced or covered. Moving machinery, stairs, trestles, etc., shall be provided with guards and hand-rails. (Sec. 17 and 18.)

Steam boilers shall be inspected yearly, and results reported to the inspection department. (Sec. 19.)

Closets must be provided underground, where men cannot go to the surface. Good quality of drinking water shall be provided. Change houses shall be equipped with shower baths, hot and cold water. Employees must use sanitary appliances, and refuse from lunch buckets must be taken care of. (Sec. 20.)

Escapeways must be provided from lowest working levels to the surface. One escapeway may be through a neighboring mine. Mines less than 300 ft. deep, where the shaft is 200 ft. deep and there is but one outlet, must maintain a ladderway compartment in the shaft. (Sec. 21 and 24.)

Inflammable structures shall not be erected over mine outlets and shafts. Outlets new covered by inflammable structures shall be protected by fire- and gas-proof doors of the type approved by the inspection department. Ample ventilation shall be provided, and in no case shall men be permitted to work where the oxygen contained in the air is less than 19½%. (Sec. 25 and 26.)

Special permit is required when stoping must be done within 20 ft. of a shaft for hoisting men or materials. Special inspection underground is required when workings are untimbered. Loose rock must be removed from timbers in manways which are in daily use. Heavily timbered stopes must be inspected for fire at the end of each shift. Working places must be amply timbered when necessary, and sufficient timber furnished by the operator. Miners shall not work when sufficient timber is not supplied. (Sec. 27 and 31.)

Tops of winzes and raises must be protected, and drifts must be fenced off when there is danger of falling material. Guard-rails or gates must be provided at shaft stations and collars. Hatches must be provided where buckets are used, passageways around shaft at level stations. Shafts must be thoroughly inspected once each week. When two repair crews are working in a shaft where the inclination is greater than 35 deg., strong bulkheads must be placed between the crews. Bulkheads are also required when shaft sinking is in progress. (Sec. 32, 33 and 56.)

When mechanical haulage is used, places of refuge 2½ ft. in width between the car and the side of the haulageway shall be provided and kept clear. When workings are advancing toward dangerous accumulations of water, bore holes shall be kept well in advance. Sumps must be covered or fenced off. Working floors of square-set stopes shall be securely lagged over, openings being protected by railings. Crossheads and guides are required when sinking a shaft which is more than 300 ft. deep. (Sec. 34 and 39.)

Ladderways must be provided from the surface to the lowest working of the mine, equipped with platforms not less than 20 ft. apart, and ladders projecting at least 3 ft. above each platform. Extension ladders are required at the shaft bottom when sinking is in progress. Stairways may be substituted for ladders when feasible. Sign boards pointing the way to exits and escapeways must be maintained. (Sec. 40.)

Dust from drilling or chutes must be allayed; the necessary devices and appliances being furnished, and miners shall use such devices and appliances. (Sec. 41.)

Candles and lamps must be extinguished on leaving the mine at the end of a shift. Stationary lights are required at shaft stations and in pumping rooms. Candles used as stationary lights must be placed in approved metal sconces. (Sec. 42.)

Special noninflammable houses are required for storage of oil and other inflammable materials, situated at least 100 ft. from mine openings and 300 ft. from powder magazines. Only one day's supply of explosive shall be taken into the mine in one day. Only one day's supply of oil shall be taken from a storage place at one time. Three days' supply of oil and small quantities of gasoline are allowed underground. Waste timber must be removed from the mine, and no timber or other inflammable material shall be stored within 100 ft. from the magazine opening. Surface magazines for storage of explosives must be fire-proof, and have fire- and bullet-proof doors. No caps or electrical detonators shall be stored in the same magazine with other explosives. Explosives underground shall be kept in locked boxes or magazines, which must be clean and dry and contain no naked lights. Caps must not be kept with powder underground. All primers and capped fuses shall be exploded within 24 hr. after making. Fuses shall not be stored underground longer than 72 hr. Boxes of explosives shall not be opened within a magazine

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underground or above ground, and in no case shall metallic instruments be used to open such boxes. Necessary thawing of dynamite must be done in specially provided places, by steam bath, hot-water device, manure or electric current, and in no case shall explosives be exposed to heat of more than 80° F. Explosives put up in cartridge form for use in mines must be covered with bright red wrappers or wrapping paper. Fire-fighting equipment shall be provided near powder magazine. Combustible substances, oil, etc., shall not be kept near a powder magazine. No explosive that evolves more noxious gas than gelatine dynamite shall be used underground. (Sec. 43 and 45.)

Notice of the rate of burning fuse, not faster than 1 ft. in 30 sec. or slower than 1 ft. in 55 sec., shall be posted at the entrance of the mine, and the superintendent is responsible for carrying out the rule. Use of oil or grease to waterproof joints between caps and fuses is forbidden. In capping fuse, at least 1 in. shall be cut from the end of each length of fuse to prevent damp ends getting into the cap. Only a crimper shall be used for attaching a fuse to blasting cap; the use of knife or teeth is forbidden. The use of hammered or injured fuse is forbidden. In cold weather, fuse must be slightly warmed before uncoiling. Bosses must take charge of blasting, and only wooden tamping rods shall be used. Missed holes must be reported, and explosives shall not be extracted from them. (Sec. 46 and 47.)

The superintendent shall establish a rate of speed of cages, etc., when men are being handled, and determine the number of men to ride at one time. Cagers or skip tenders must be employed where there are more than 50 underground men. Wooden rails shall not be used as skidways, or tracks in inclined shafts. Open hooks shall not be used with bucket, skip or cage. When hoisting men, the hoist engineer must be over 21 yr. of age and able to read English readily. Duties of hoisting engineers are set fourth in 15 paragraphs. The same rules are now generally enforced. Safeguards against overwinding are required. Metal hoisting ropes are required and must be of a factor of safety of not less than five. Regular inspection of hoisting rope is required, and worn ropes must be immediately discarded. Two turns of hoisting rope must always remain on the drum, and ropes must be dressed once a month. Bonneted cages with safety catches are required in vertical shafts when men are being handled. Other conventional rules applied to hoisting are adopted, including the oiling of cage safety catches, and hoisting while sinking shafts. (Sec. 48 and 55.)

Telephones are required in mines more than 500 ft. deep. Signaling devices are required in shafts. California Mine Bell Signals law must be adopted as far as applicable or necessary. Special signal boards are required at shaft stations. (Sec. 57 and 60.)

Electrical rules cover the following subjects: Definitions, care of equipment, standard practices, grounding, voltage, ground detectors, switchboards, danger signals, fire protection, emergency lights, plan of electric system, report of defective system, notice of new installation, underground stations and transformer rooms, transmission lines and cables and high-voltage wires, support of cables and wires, overhead lines above ground, buried cables, protection of circuits leading underground, branch circuits, lighting circuits, underground trolley, protection of trolley wires, power wires and cables in shafts, cables in main roads, protection of cables during blasting, cables entering fittings, joints in conductors, joints in cables, fuses, circuit breakers, switches, stationary motors and electric lighting. (Sec. 61 and 68.)

Beatty Wins Decision

In 1913 Justice Gerard of the New York Supreme Court rendered a decision in favor of the defendant in the case of A. Chester Beatty vs. the Guggenheim Exploration Co., to recover $54,000 in cash, 23,000 shares of the Yukon Gold Co. and certain damages for nondelivery of said stock. The Appelate Division of the Supreme Court of New York last week reversed Justice Gerard's ruling and handed down a decision in favor of Beatty. It is understood that the attorneys for the Guggenheim Exploration Co. will take an appeal to the Court of Appeals of the State of New York at Albany.

It will be recalled that the Yukon Gold Co. negotiations could not be put through on the original basis, being unacceptable to A. N. C. Treadgold. Mr. Treadgold, however, required money at an early date to hold certain options. Mr. Beatty and Mr. Perry, but mainly the former, advanced personally certain sums of money preventing the disintegration of the Treadgold properties, and in return Mr. Perry received an interest, a portion of which he held for Mr. Beatty. The latter acquainted his chief, John Hays Hammond, with these facts, and Daniel Guggenheim also knew of Mr. Beatty's personal participation. The company, however, claimed that this was a secret profit which Mr. Beatty's contract prohibited.

Chronology of Mining for May, 1915

May 1—Crushing plant of Oliver Iron Mining Co., at Escanaba, Mich., started operations. Lake Superior Hematite property of Oliver Iron Mining Co., Ishpeming, closed down and abandoned. Calumet & Hecla company granted increase of 10% in wages of surface and underground men. Decision by Judge Bourquin of the Federal Court in suit against the Anaconda company provides that the Alice mining property, sold some time ago to the defendant, shall again be offered for sale.

May 3—Stamp mill at White Pine mine, Ontanagon, Mich., started regular operation. Alaska coal lands case nol-prossed at the request of the Attorney General; said to be on account of lack of evidence. Bullwhacker Copper Co., Butte, started operations after a long shutdown.

May 4—H. L. & S. concentrating mill at Lawson, Kan., lost as the result of a cave-in; loss, $10,000. Work at Alice mine suspended by Anaconda company as a result of adverse decision in suit over its purchase.

May 7—Lusitania sunk by torpedo off coast of Ireland; many American mining men among 1500 persons lost.

May 10—Decision rendered by U. S. Supreme Court in favor of the State of Georgia in its suit against the Ducktown Sulphur, Copper & Iron Co. for an injunction to prevent the company from allowing fumes to diffuse over the state border.

May 14—Head frame at Iron Mountain mine, Minnesota, tipped over by railroad accident.

May 15—Announcement of merging of Tonopah Extension, Tonopah Merger and Tonopah Victor mining companies; not yet ratified by the several companies. Section 47 miles long of 170-mile oil pipe-line from Coalinga to Martinez put in successful operation.

May 17—New Washoe acid plant of Anaconda company put in commission. No. 1 reverberatory at International smeltery, Miami, filled with calcines for first time. Shaft house at Chambers-Fernald mine, Cobalt, destroyed by fire.

May 18—Chile Exploration Co.'s plant at Chuquicamata started operations. New record established at Duluth docks by loading 10 boats with 86,000 tons of ore in one 10-hr. shift.

May 20—Bishop Creek mill, Inyo County, Calif., started operations.

May 22—Mount Lassen, California, broke into eruption.

May 23—Italy declared war on Austria-Hungary.

May 26—Shift boss at Utah Apex mine, Bingham, murdered by discharged employee.

May 28—Utah, Nevada, Ray and Chino declared dividends; all raising rates except Ray, which was a return to the rate paid before passing its dividends.

May 30—Violent eruption of Mount Lassen; first eruption May 30, 1914.

Port Pirie, Australia, Smelting Plant

Meetings of the North Broken Hill and Broken Hill South Mining companies were held in Melbourne, Apr. 29. These companies adopted the proposal to form a new company, in conjunction with the Broken Hill Proprietary Co., to take over the Port Pirie (S. A.) smelting works, Bellambi coke works and other assets and contracts of the Proprietary, according to the *Australian Statesman and Mining Standard*. The nominal capital of the new company will be £750,000, of which £600,000 will be issued at once. The Proprietary company will be paid £450,000, £200,000 being in fully paid shares in the new company and the balance in cash. The North and South companies each take up £200,000 in shares, making up the £600,000 now being issued. It is thought that some of the other companies will wish to participate, in which case the reserve shares will be drawn upon.

According to the statement made by the chairman, W. M. Hyndman, at the North Broken Hill meeting, the three contracting companies will enter into agreements whereby the whole output of lead concentrates produced at Broken Hill for 50 years will be disposed of to the smelting company. The new company will take over the works on June 2. In order to maintain the strength of the company's financial position, £250,000 worth of 6% debentures will be issued, of which £200,000 will be available immediately.

The new company will be entirely British. The directors are Messrs. Bowes Kelly, Duncan McBryde, F. C. Howard, W. L. Baillieu, M. L. C., and W. C. Robinson.

It was later officially announced that the directors of the Zinc Corporation have accepted a participation of £100,000 in the Broken Hill Associated Smelters Proprietary, Ltd. This is the lead-smelting combination formed by the Broken Hill Proprietary, North Broken Hill and Broken Hill South to acquire the Port Pirie smelteries of the Broken Hill Proprietary. From the wording of the official notice, it may be inferred that the Zinc Corporation was asked to put up a large sum of money; but whether the participation of the other three companies is reduced in favor of the Zinc Corporation or whether the corporation buys reserve shares is not clear, says the *Financial News* of London. Possibly there is some connection between this participation and the refusal of the Treasury to allow shareholders on the London register of the three Broken Hill companies interested to subscribe. Or it may be that the Zinc Corporation had a hand in the scheme some time ago, and has only just announced the fact. The matter will doubtless be elucidated in the forthcoming annual report of the corporation.

Improvements at Mt. Lyell

The Mount Lyell Mining & Ry. Co. has decided to proceed with the installation of a flotation plant at Mt. Lyell, Tasmania, according to the *Financial Times* of May 19, 1915. It is also intended to remodel the converter plant, which was resolved on two years ago. Inconvenience having been caused in past summers by shortage of water for smelting purposes through the exceptionally long spells of dry weather, it has been decided to build another large reservoir adjoining the two already constructed on the western branch of the Queen River, which will increase the present storage by several million gallons.

Platinum in California

SPECIAL CORRESPONDENCE

The presence of a strange metal in the ores of the Long Tom mine, near Bakersfield, Calif., was noticed in April during the retorting of a batch of amalgam. The retort residue had about the appearance of babbitt metal, and an investigation was begun to explain its presence. A second batch of quicksilver from the mill-trap was retorted with the same result. The presence of platinum and of palladium was suspected, but the latter was eliminated after several tests. The presence of platinum, however, is believed by those who made the tests to be satisfactorily established.

The tests for platinum being somewhat unusual, the experimenters followed the outline given by Lodge, of the Massachusetts Institute of Technology. Isolating some of the particles which were under suspicion, they appeared as a grayish white metal heavier than iron and other sulphides, and occurring in diamond shape as well as in cubes, and also in smaller flat and granular particles. The isolated material was dissolved in *aqua regia*, the nitric acid dispelled by using hydrochloric, and the solution evaporated to a sirup. Taking up this sirup with a drop or two of distilled water and cooling, portions were taken and treated with a drop of concentrated potassium-iodide solution. The deep wine-red color, as noted by Lodge, was obtained in each instance and, upon reheating the solution, disappeared. Another portion of the water solution was tested with a solution of ammonium chloride and allowed to stand over 24 hr., when the yellow crystals of ammonium chloroplatinate came down. The test was again confirmed, as in the previous case, by operations with specimens of pure platinum. The experiments were made, both together and independently, by Ward M. Mills, of the Bakersfield (Calif.) High School, and Ralph W. Bender, metallurgist of the Long Tom mine.

[The assay for platinum, or even its qualitative determination, is unusual and extremely difficult to perform without special experience. In proving the occurrence of this unusual element it would be necessary to leave no stone unturned to be sure that the metal was not introduced in some accidental manner. Tests upon the material used for making the assays would be important, particularly in the case of quicksilver, and perhaps some of the materials used for assay. Again, tests should be made on different portions of ore or concentrate, and the samples should be retaken, checked and rechecked to avoid any possibility for error. When all of this has been done by one experienced in the detection of the Pt group of metals the presence of platinum might be announced with justification. For instance, in the present case, the iodine reaction shows only some metal which is being reduced from higher to lower valence. Ferric chloride will give this reaction. As to the formation of

an $(NH_4)_2 Pt Cl_6$ precipitate, not enough is told of the conditions to judge of the work. There may be platinum there, but its existence is not proved by this testimony.—EDITOR.]

Decision in the Steel Corporation Case

The general points in the decision of the U. S. Circuit Court in the anti-trust prosecution against the Steel Trust are reviewed on the editorial pages. The Court's remarks concerning the so-called Gary dinners and the conclusions of the judges are printed below.

These meetings, it is stated, were attended by some 45% of the steel industry, in addition to representatives of the Steel Corporation, in all 90 to 95% of the steel industry of the country. The testimony as to what happened at these meetings is cited, and the court then states:

To our minds, the testimony taken as a whole makes the conclusion inevitable that the result of these meetings was an understanding about prices that was equivalent to an agreement.

Certainly there was no positive and expressed obligation. No formal words of contract were used. Most of those that took part in these meetings went away intending to do what they pleased, but many, probably most of the participants, understood and assented to the view that they were under some kind of an obligation to adhere to the prices that had been announced or declared as the general sense of the meeting, and feeling bound to maintain them until they saw good reason to do otherwise, and until they had signified to their associates their intention to make a change.

We cannot doubt that such an arrangement, or understanding, or moral obligation, whatever name may be the most appropriate, amounts to a combination or common action forbidden by law. The final test, we think, is the object and effect of the arrangement, and both the object and the effect were to maintain prices, at least to a considerable degree.

The testimony quoted will make it abundantly clear, we think, that even prices formally assented to at these meetings were not regarded at all by many manufacturers, for it is plain that the consumers who testified had no difficulty in buying at rates sensibly below the prices thus referred to.

It is only fair to add that, in our opinion, the participants in this movement did not intend to act illegally. No doubt they did intend to exercise their full legal rights, but of course they could not be wrong in so doing, and they believed they had succeeded in keeping within the proper limits.

For the reasons given, we think they were mistaken, but we acquit them of trickiness or attempted evasion.

But the period of coöperation had passed away before the bill was filed, and, as far as we can see, it is not likely to be repeated.

We do not think the Gary movement would justify us in imposing so drastic a penalty as the dissolution of the corporation, but we will, if the Government moves for such action, retain the bill for the purpose of restraining any similar movement by the defendants that might be contemplated hereafter.

We may perhaps suggest that, under recent legislation, Congress may have provided a sufficiently active remedy for any future action that might have for its object the adoption or the maintenance of unreasonable prices.

CONCLUSIONS

In brief, the conclusions of the court are these:

As to some of the defendants it is apparent the bill should be dismissed.

Concerning the principal relief sought against the corporation and its subsidiaries, we are of opinion that the Government has not made out a case that should be followed by a decree of dissolution, and we are also of opinion that sufficient reasons have not been afforded to justify us in now awarding an injunction.

But, as already stated, if the Government so desires, the court will retain jurisdiction of the cause for the purposes above outlined.

All of the four judges concur in the final result, and are in entire agreement as to the decree to be entered, although Judge Woolley in his separate opinion, which is concurred in by Judge Hunt, shows that his conclusions are based upon somewhat different grounds than those of the other two judges referred to at length above.

The four points discussed by Judge Woolley and his reasoning thereon may be summarized as follows:

First. Was the direct and necessary effect of the organization of the Steel Corporation unduly to restrain trade or to create a monopoly?

(a) Regarding its control over raw materials, the corporation has not been guilty of monopoly, and the bill is dismissed as against the defendants, Rockefeller, who were alleged to have combined with the corporation in restraining trade in iron ores.

(b) Regarding the charge of monopoly growing out of the Steel Corporation's control over finished products, it is found that the corporation does not dominate the industry, and that its size and consequent power are not sufficient to retard the growth of efficient competition. In distinguishing the power of the corporation from the intent with which it was formed, and its conduct subsequent to its organization, it is held that in its inherent nature the corporation is not a monopoly, and that the direct and necessary effect of its organization is not to unduly restrain trade.

Second. Was an intent to monopolize or unduly restrain trade shown by the circumstances which led up to and surrounded the organization of the corporation?

On this branch of the case it is found that the object of the formation of the corporation was to eliminate competition, but that, notwithstanding the intent of its organizers, and its size, it happened that the corporation, after its organization, was confronted by forces beyond its control, and was affected by trade laws and conditions which had been either forgotten or ignored, and that in competing with others who entered the field against its subsidiaries supplied with ample resources, equipped with modern plants and unencumbered with obsolete and dismantled properties, it was without power alone to do what its organizers expected of it; that it lacked the power of monopoly, and was immediately forced to resort to old devices of pools in order to control the price of its products.

Third. Was intent to monopolize or restrain trade shown by the after conduct of the corporation?

After stating that the corporation did not resort to the usual methods to restrain trade, such as receiving rebates, opposing labor, deteriorating the quality of its products, creating an artificial scarcity of raw or finished materials, oppressing or coercing its competitors, the opinion says that the only conduct of the corporation violating the statute consisted in coöperating with competitors by other means and at different times in fixing and maintaining prices.

Fourth. In 1911 and prior to the filing of the bill, the corporation, it is found, had entirely ceased to coöperate with its competitors in fixing or regulating prices.

Alaska Mines Combination

The Morgan-Guggenheim syndicate has combined the valuable copper mines in the syndicate's Alaska holdings into the Kennecott Copper Corporation. J. P. Morgan & Co. has purchased an issue of $10,000,000 of 10-year 6% bonds of the new company and placed them with investors privately.

The syndicate's principal investments are in these mines and in the Copper River & Northwestern Ry. It is said that the Kennecott financing is for the purpose of reimbursing the syndicate for sums expended upon development work and for the provision of capital for the acquisition of additional properties.

The Kennecott Copper Corporation was organized recently in New York with issued capital stock of 672,000 shares without par value. There will be issued an additional 400,000 shares to provide for conversion of the bonds, the holders of the latter having the right after two years to convert them into stock at the rate of 40 shares for each $1000 bond. The bonds are redeemable on June 1, 1917, and on any subsequent interest day at 105. The mortgage securing the bonds provides for an annual sinking-fund payment equal to at least 50% of the net earnings of the corporation. A certificate increasing the capi-

tal stock from $500 to $6,000,000 was filed at Albany on Saturday, and the corporation tax of $36,000 paid.

The new corporation has also taken over the stock of the Beatson Copper Co. Control of the new company through the stock will remain with the Morgan-Guggenheim interests.

Supreme Court Decides Against Ducktown Company

On May 10, 1915, the Supreme Court handed down a decision outlining the conditions under which the Ducktown Copper, Sulphur & Iron Co. might operate its smelting plant and acid works at Isabella, Tenn.

The decision is the outcome of a proceeding begun in 1905 by the State of Georgia vs. the Tennessee Copper Co. and the Ducktown Copper, Sulphur & Iron Co., which were smelting copper ores in Polk County, Tennessee, near the Georgia line. The works of the former company is about one-half mile from the boundary, and that of the Ducktown company is about 2½ mi. from the Georgia line. The state claimed damage to vegetation within its borders from noxious gases of the smelting works, and the case was determined in its favor in May, 1907. The time for entering the decree of injunction, however, was postponed to permit the defendants to complete the acid works they were then constructing in an endeavor to eliminate the objectionable gases.

The Tennessee Copper Co. and the State of Georgia finally entered into a stipulation whereby the company undertook to supply a fund to compensate those injured by fumes from its works, to conduct its plant subject to inspection in specified ways, and between Apr. 10 and Oct. 1 not to "operate more green-ore furnaces than it finds necessary to permit of operating its sulphuric-acid plant at normal capacity." The state agreed to refrain from asking for an injunction prior to October, 1916, if the stipulation were fully observed. Thus the Tennessee company is not directly concerned with the recent decision, although it is named as one of the defendants.

The Ducktown company and the State of Georgia were unable to reach an agreement, and in February, 1914, the state asked for a perpetual injunction. The company maintained that conditions had changed materially since 1907, and leave was granted to present "additional testimony to relate solely to the changed conditions" which had arisen since the case was decided. After considering the new evidence submitted, the court declares that insufficient data were presented to judge of the results attained and prescribes the conditions under which the Ducktown company's works may be operated. The decision so far as it relates to the operations of the Ducktown Copper, Sulphur & Iron Co. is as follows:

The Ducktown company has spent large sums—$600,000 and more—since the former opinion in constructing purifying works (acid plant); and a much smaller proportion of the sulphur contained in the ores now escapes into the air as sulphur dioxide—possibly only 41½% as against 85½% under former conditions. Similar improvements have been installed by the Tennessee company at great expense, but we are without adequate information concerning the effect produced by them. As it asked and was granted opportunity to show material changes, the burden is upon the Ducktown company. A full and complete disclosure of the improvements installed by it and the results continuously obtained have not been presented.

Counsel maintain that escaping sulphur fumes now produce no substantial damage in Georgia, and further that if any such damage is being done, the Tennessee company alone is responsible therefor. We think the proof fails to support either branch of the defense, and the state should have a decree adequate to diminish materially the present probability of damage to its citizens.

The evidence does not disclose with accuracy the volume or true character of the fumes which are being driven off daily from the works of either company. Averages may not be relied on with confidence, since improper operation for a single week or day might destroy vegetation over a large area, while the emission of great quantities of fumes during a short period would affect but slightly the average for a month or year.

It appears that in 1913 the total ores smelted by the Ducktown company amounted to 152,249 tons, or 304,498,000 lb.—20% sulphur; total matte shipped was 12,537,000 lb.—about 4% of the ore; the total sulphur in the smelted ores not accounted for and which escaped into the air in the form of dioxide was 13,102 tons, or 26,204,000 lb.—over 2 lb. of sulphur for each pound of matte and an average of more than 35 tons per day.

During July, 1913, the total matte shipped (approximately the production) was 846,000 lb.—more was shipped in June and less in August. The July production was thus approximately 7% of the year's total. The sulphur in the fumes generated in connection with the production for this month, not redeemed by the acid plant and emitted into the air, may be fairly estimated as not less than 7% of 13,102 or 917 tons—substantially 30 tons per day. This amount produced harmful results and must be diminished.

It is impossible from the record to ascertain with certainty the reduction in the sulphur content of emitted gases necessary to render the territory of Georgia immune from injury therefrom; but adequate relief, we are disposed to think, will follow a decree restraining the Ducktown company from continuing to operate its plant otherwise than upon the terms and conditions following:

(1) It shall keep daily records showing fully and in detail the course and result of the operations.

(2) A competent inspector to be appointed by this court shall have access to all the books and records of the company, shall make frequent careful observations of the conditions—at least once each fortnight—during the next six months, and at the end of that time shall make full report with appropriate recommendations. An adequate sum to cover the necessary costs and expenses must be deposited with the clerk by the company.

(3) It shall not permit the escape into the air of fumes carrying more than 45% of the sulphur contained in the green ore subjected to smelting.

(4) It shall not permit escape into the air of gases the total sulphur content of which shall exceed 20 tons during one day from Apr. 10 to Oct. 1 of each year or exceed 40 tons in one day during any other season.

The cause will be retained for further action and either party may apply hereafter for appropriate relief. Within 10 days either side may present a decree in conformity herewith, together with such suggestions as seem desirable.

Justice Hughes dissented from the decision, saying: "I do not think that the evidence justifies the decree limiting production as stated." The Chief Justice and Justice Holmes joined in this dissent.

The Anaconda Improvements

Section 1 of the Washoe concentrator, with the new flotation process, is now in operation. The capacity of this section is 2000 tons of ore per day. The new leaching plant (with a capacity of 2000 tons per day) and the acid plant (with a capacity of 100 tons of acid daily) were put in operation about a fortnight ago and are working satisfactorily.

Duration of Michigan Leases

The clause of the Michigan Constitution which forbids a lease of agricultural lands for a longer period than 12 years under a single lease does not invalidate a lease of agricultural land for mining ore for 50 years, although the contract excludes any right in the lessee to utilize the land for agricultural purposes. This is the holding of the Michigan Supreme Court in the recent case of De Grasse *vs.* Verona Mining Co., 152 *Northwestern Reporter,* 242.

Editorials

The Steel Decision

The decision of the United States Circuit Court at Trenton, June 3, in the long-pending case of the Government versus the U. S. Steel Corporation for dissolution of the latter on the ground of its alleged violation of the Anti-Trust Law cleared the atmosphere of business. The case has, of course, been appealed to the Supreme Court by the Government, but in view of the unanimity in the decision rendered by the judges of the Circuit Court and the common sense of that decision, there is little concern about a possible reversal by the Supreme Court.

Judge Buffington and his associates decided that the evidence showed that the U. S. Steel Corporation had not throttled competition. They found, on the contrary, that since the organization of the corporation the business of its competitors had increased proportionately more than its own. This was merely an establishment of fact, and was exactly in line with the opinion expressed by unprejudiced persons acquainted with the conditions of the iron and steel industry ever since the Government's suit was brought.

With respect to matters of opinion the important things in the judgment of the court were the transactions involving the purchase of the Tennessee Coal & Iron Co. in 1907, the bigness of the U. S. Steel Corporation, and the Gary dinners. The Court decided that the Tennessee transaction was a proper one, thus settling a political controversy that has been constantly cropping up.

The most important thing in the decision, however, is the pronouncement that mere bigness in corporate business is not a crime. Our country has been growing big, and our corporations, our business interests, have been growing big along with it. Some of our fellow citizens would have it that this was a crime. In the Trenton decision it is said flatly that it is no crime. The big corporation must do something illegal before it can be held to be criminal.

In the price fixing through the medium of the famous Gary dinners the U. S. Steel Corporation did something that was illegal in the opinion of the Court, but the Steel Corporation had abolished that practice before the Government brought its dissolution suit, and therefore no charge could be maintained against the corporation on that score. The corporation had been guilty of an improper practice inadvertently, but upon its own discovery thereof voluntarily discontinued it. Indeed, everybody of intelligence knows that from the beginning of the anti-trust movement the directors of the U. S. Steel Corporation searched themselves and their affairs with minuteness for the purpose of purging their company of everything about which there was the least suspicion of illegality.

We know now from the Trenton decision that there is nothing illegal in the organization and operation of a big company. We know moreover that there must not be any collusion in fixing prices. These set up two important and unmistakable guide posts for the direction of business and the enthusiastic public response shows that they are satisfactory.

Equally satisfactory is the indication of a favorable change in public sentiment respecting the big business interests of this country, a disappearance of the trust-baiting fury, and the passing into obsolescence of the disgraceful demagogues who did so much to stir it up.

The Situation in Lead

During the last fortnight lead, ordinarily the most quiet of the major metals, has experienced an advance in price nothing less than spectacular. Wall Street early had the tip that it was going promptly to 6c. and speculators had visions of a repetition of the performances in spelter. Recent events have taught that anything is possible in the metal markets during this time of war. With regard to the situation in lead and the conditions that started the advance, certain things stand out as facts, but other things are shrouded in mystery.

The lead market had been strong for a considerable time while the leading interest was maintaining its price at 4.20c., as was shown by a higher price being realized by independent producers, buyers being willing to pay what they asked. The Missouri producers had increased their output to the rate of a year ago, or nearly thereto. On the other hand the producers of the Cœur d'Alene and of Utah and Colorado had failed to increase their production to the former rate.

A reason assigned for the first advance in price from the level of 4.20c. was the desire to stimulate the production of the mines, an increased demand for lead in the second half of 1915 being foreseen. In order to do that, however, no such advance as 1c. per lb. within 10 days was necessary. The advance of a mere fraction thereof would have done all the stimulating that would have been desirable. Upon the advance a large volume of business was done. The increases that were made from day to day were in conformity with the orders received.

The buying orders were to a considerable extent from the manufacturers of ammunition, and to a considerable extent were ostensibly orders for export. In some of the latter buying, however, it was thought that there could be detected the hand of a speculative pool that was contemplating the same kind of an operation which was so successfully conducted in the early days of the advance in copper.

The probability is that the advance was started by the buying for ammunition and that some speculative interests intervened, producing a competition that enabled sellers to make their own terms. A matter of much interest in this connection is the quantity of accumulated stocks in the hands of the lead producers. This is ever a subject of mystery for reasons that we have frequently stated. For a long series of years the position of lead stocks has been nothing but surmise and guess in so far as the public is concerned and indeed the independent

producers themselves. At the present time there is no doubt some unsold stock of lead on hand. Certain persons of good information believe it to be rather large; others of equally good information believe it to be rather small. The extremes of the two views might be represented by the figures of 35,000 to 85,000 tons. We have no idea whether either of those figures is anywhere near the truth. We are inclined to believe, however, that the lead stock is not very large.

The Liquidation of Stratton's Independence

The liquidation of Stratton's Independence, Ltd., which is now being executed, following a meeting of the stockholders last month, will terminate an interesting British investment in a Colorado mine. The output of the mine to the present time has been about $23,573,500, of which Mr. Stratton obtained $3,985,440, the old Stratton's Independence Co., $15,064,320, and the present company, which was a reconstruction of the first British company, $4,523,740. The old Stratton's company paid $4,748,989 in dividends, which was 31.5% of the gross value of the ore produced. In 1906 Philip Argall was appointed to take charge of the property, at a time when the mine was regarded as approaching its end. Mr. Argall recommended the erection of a mill of 120,000 tons annual capacity for the purpose of treating the ore in the dump, and by a reconstruction of the company about $250,000 was raised for the completion of the mill.

The subsequent record of this company, under the direction of Mr. Argall, is one of the brilliant achievements of modern mining and metallurgical engineering. The first unit of the mill was put in operation in April, 1909. The second unit, paid for out of profits, was put in operation in March, 1911, bringing the milling capacity up to about 130,000 tons per annum. The sampling of the dump by employees of the old company had led to the expectation of an average grade of $3.60 per ton. In fact it turned out to be only about $3 per ton. Nevertheless, the estimated profit of $1 per ton was nearly realized, for the reason that Mr. Argall's estimated cost of $1.52 per ton milled—a cost for mining and milling this dump ore which many said would never be attained—was bettered by 14c., and the promised gold extraction of 70% was gradually raised to the neighborhood of 80%. As things have turned out, the estimated profits, figured in 1908, have been realized within 2% of the prediction, and that 2% was in favor of the stockholders.

To the management it was ever an irritating feature that when the mine was exhausted and the dump of low-grade ore was milled, the excellent reduction plant would probably become valueless, notwithstanding that this was contemplated in the original plans. As is so often the case, fortune once more favored the brave, and Stratton's Independence had an opportunity to sell its property, especially its mill, to the Portland Gold Mining Co. for about $300,000. This transaction was consummated in May, and Stratton's Independence now finds itself with cash resources of about $450,000, the disposition of which has not yet been determined. Having learned what mining and milling are when conducted upon a sound basis, most of the stockholders in this company appear to be desirous of continuing in the business. The engineers for the company will therefore probably be looking for a new mine to develop, although for the moment the affairs of the company are tied up by legal matters attending the conclusion of its Cripple Creek enterprise.

New Alaska Mining Law

The Territorial Legislature has passed a new mining code supplementing the mining laws of the United States in Alaska which repeals the so-called Roden Bill, passed in 1913, which has caused such widespread discussion and dissatisfaction. That portion of the code which relates to the location, etc., of lode claims is the direct result of the earnest effort of the Alaska Mining & Engineering Society, which consists of about 60 of the best-known resident engineers of the territory, including the members of the staffs of the Treadwell, Gastineau, Juneau, Ebner and other prominent companies. A committee drew up a tentative act which was submitted to the society for general discussion at two sessions. At these meetings the Mines and Mining Committee of the Territorial Senate and House were present and a full discussion was had and better understanding of some of the more technical provisions was arrived at than could have been secured otherwise.

With certain small amendments, the act was duly passed by both houses and approved by the governor in substantially the form in which it was drawn by the society, and it may therefore be said to be a legitimate child of the engineering profession.

Two points seem noteworthy in this connection. First, while it is conceded that the act is not altogether free from defects, it will serve a useful purpose, having been drawn by experienced, not to say talented, engineers. Second, the rounding out of this act was done by the Engineering Society and the joint Legislative Committee at *meetings of the society* where the atmosphere, for psychological reasons, if no others, is much more conducive to thorough technical deliberation and discussion than are the legislative chambers. The ideal way to frame practical legislation is on lines similar to those which brought to successful fruition these efforts of the Alaska Mining & Engineering Society.

Cobalt to be Produced in the United States

It is understood that the American Smelting & Refining Co. is about to begin the recovery of cobalt and cobalt oxide at its plant at Maurer, N. J., presumably from the Cobalt ores treated now for their silver content.

Cobalt is of growing importance among the metals, largely through the work of Elwood Haynes in developing non-corrosive and high-speed cutting cobalt alloys, and through the work of Doctor Kalmus for the Canadian Government in working out formulas for cobalt-plating baths which seem faster in operation and easier to keep in condition than are nickel baths, while the resulting plate is equally satisfactory.

This new move of the Smelting Company seems to be the logical outcome of the progressive research work on byproducts which it has been prosecuting for the last several years.

BY THE WAY

The rise in the value of zinc ore at Joplin, Mo., occurred with music. The event was thus described by the Joplin *Globe*: "Enthusiasts in Joplin circulated a subscription list to engage the Carthage band to play on Main Street, Friday night, June 4, in celebration of the arrival of $100 zinc. By the time the band had been engaged, the price had gone to $102 a ton. By the time the uniformed players, instruments in hand, arrived in Joplin it was learned $105 had been paid. By the end of the second selection it was $106. When the program was half over it was reported $110 had been paid, and before the closing march it was learned on reliable authority that a base price of $112 had been paid for local zinc ore."

The British appear to be wasting a large percentage of their best human material in their process of "muddling along" in the war, but occasionally their eyes are opened. There are many in this country who know Walter Gardner, son of Henry Gardner, managing director of Henry R. Merton & Co. Young Gardner studied mining engineering at Freiberg and later at Columbia. Soon after the outbreak of the war he enlisted in the British army, and went to the front. It is told of him that after serving as a private in the trenches for about six months, some sapping plans were inaugurated at the point where he was. Therein his mining experience played a useful part, of course, and attracted the attention of his superiors, who obtained the idea that such knowledge could be employed better than in the ranks. Consequently young Gardner was sent home for a little training in military engineering, after which he was returned to the front with a commission.

Our old New Mexican friend Alum Mountain is again in the limelight, its inexhaustible deposits greatly enriched by metasomatic infiltration during its two years' absence. "Standing near the headwaters of the Gila River in New Mexico there is a mountain 1000 ft. high and 2 square miles in area which is devoid of all vegetation except cactus and agave, and which is believed to be one of the most highly mineralized masses of rock in existence. This is known as the Alum Mountain and it is owned by one man," states *Popular Mechanics*. "One of the minerals which form a large proportion of the mountain's billions of tons of rock is so rich in aluminum that it is expected to afford an inexhaustible supply after the bauxite deposits of the East are used up. The peak is of volcanic origin, and it is thought that almost pure aluminum, as well as large deposits of gold, will ultimately be found in it. Beautiful imitation rubies, emeralds, topazes and diamonds have been made from its minerals. It is also expected to prove a valuable source of sulphuric acid, which is in great demand as a reducer of phosphate rock for fertilizer." Al_2O_3—Al, 53.3%; O, 46.7%—nearly pure aluminum! Why gold, why not gallium or samarium, if we are just supposing? Why sulphuric acid? What's the use, anyhow? But possibly the newspaper that claims to have taken this from *Popular Mechanics* has butchered it in transmission.

The *Marion County News*, a yeller of Yellville, Ark., emitted the following yell:

> The "Engineering and Mining Journal" recently published an editorial under the caption, "Don't Buy Zinc Mines Now." The burden of its argument in support of such strange advice, is because of the unusually high price of ore and the temptation to float worthless mining stocks and properties on the public, thus assuming that the investor in such enterprises is not capable of looking into the merit of what is offered for sale.
>
> To be sure the war is doubtless having something to do with the unprecedented price of spelter, which will, in all probability, decline when peace is made. But spelter can decline in price very materially without necessarily affecting the price of ore, if the past ratio of values are to be respected in the future.
>
> We wonder what influence stimulated that publication to volunteer such counsel to the public without charge, just at a time when conditions are most peculiarly favorable to the opening up of new fields, where mining investments can be made to better advantage than ever before.
>
> Can it be possible that some great power behind the throne, such as the smelter trust, had anything to do with inspiring this piece of sage advice, in order to discourage investors and give the public cold feet on zinc mining investments, while the smelters and their allies gobble up and get a corner on the zinc mines of the country?

This is reminiscent of the allegations respecting the British gold of the Cobden Club which for so many years was imagined to be working against the disinterested citizens of this country who wanted to maintain a high tariff. Why smelters whose business is smelting ore should desire to discourage the production of ore deponent saith not. But, nay, we overlooked the possibility that the smelters may want to gobble up and corner the zinc mines of the country. The owners of zinc mines would best watch out lest the bogy man get him.

Decision Against Southern Pacific in Oil-Land Case

A telegram of June 8 from the United States district attorney at Los Angeles announces a decision favorable to the Government in the six suits pending in the district court for the return of oil lands now held by the Southern Pacific Co. The Department of Justice at Washington has issued the following announcement:

> The patents for these lands were issued more than six years prior to the institution of the suits, and the railroad company filed motions to dismiss the Government's bills upon the ground that the suits were barred by the statute of limitations, the act of Mar. 2, 1896, providing that no suit should be brought to cancel patents after six years after the date of their issue. The Government contended that the patents were secured by fraudulent representations of the railroad company's agents that the lands were not mineral, when in fact they were mineral and were known to be so at the time of their selection and at the time of the issue of the patents; that the railroad company had devised a scheme whereby its fraud in securing the patents was concealed and that such fraud did not become known until a comparatively short time before the bills were filed.
>
> The railroad company also contended that the Government's bills did not sufficiently show that the lands were valuable for their mineral contents.
>
> The decision of the court upholds the Government's bills in every particular and constitutes a sweeping victory for the Government.

The Southern Pacific won its case on these lands in the Supreme Court. The court ruled, however, that the Government could bring another suit if it alleged fraud. This the Government did two days before the limitation of time within which the suit could be filed. Local officials of the Southern Pacific believe that the present decision is merely a denial of a preliminary motion of the company to dismiss the suit.

PERSONALS

C. W. Merrill, of San Francisco, is visiting New York.

Otto Wartenweiler has been in Ploche, Nev. He will design a mill for Yuba Leasing Co. there.

R. B. Brinsmade spent May examining gold and copper mines near Jalapa in the state of Vera Cruz, Mexico.

John T. Reid, of Lovelock, Nev., is at the Herald Square Hotel, New York. He will return to Nevada next week.

W. H. Howard, of the A. S. & R. Co., whose headquarters are in Salt Lake, Utah, is in New York for a couple of weeks.

F. W. Bradley, of San Francisco, who has been ill for some weeks, intends to go to Honolulu and remain there until the end of July.

J. B. Tyrrell, of Toronto, Ont., was elected president of the Geological Section of the Royal Society of Canada at the annual meeting, May 27, in Ottawa.

John D. Ryan has been elected president of the Anaconda Copper Mining Co., B. B. Thayer becoming vice-persident. C. F. Kelly, of Butte, Mont., is also a vice-president.

Frank H. Probert has given up his offices at Los Angeles and has removed to Berkeley, Calif., where his address is 28 Oak Vale Ave. He expects to open offices in San Francisco later.

Henry M. Payne is now at Dawson, Yukon Territory, engaged on professional work. About the end of this month he will return to San Francisco, whence he will sail for Siberia.

John W. Mackenzie, of San Francisco, is to go to Juneau, Alaska, as managing director of the Alaska-Juneau Gold Mining Co. to supervise the opening of the mine in a more extensive way.

A party including President A. M. Hay, Sir Henry Pellatt; I. J. R. Muirling, C. B. Flynn, M. P. Vandervoort of New York and B. W. McKinnon Chicago left Toronto, Ont., for Porcupine June 4 to inspect the McIntyre Mine.

The Houghton National Bank celebrated its fiftieth anniversary on June 9, with capital of $200,000 and surplus of $470,117. "A half century of uninterrupted service and successful achievement, spanning the history of the Copper Country since the Civil War."

George O. Bradley, Charles E. Bruff and Jules Labarthe announce the opening of offices in the Hobart Building, San Francisco, under the firm name of Bradley, Bruff & Labarthe, designing and construction engineers for mining, milling, smelting, power and metallurgical installations.

Messmore Kendall tendered a dinner at the Lotos Club, New York, on May 27, to William Braden, the organizer and founder of the Braden Copper Co., who has been spending the better part of his life in the past 10 years in Chile, and who is returning there to continue the development of important copper properties.

Huan-Yi Liang, president of the Sue Kow Shan Government lead mine, of Hunan, China, is a member of the Chinese Trade Commission that has been visiting New York. Mr. Liang, who studied at Berkeley, Calif., and later at the Royal School of Mines, London, became very successful in developing antimony mines in China and is now one of the largest producers of antimony.

OBITUARY

Daniel Mahoney died at Pueblo, Colo., June 1, aged 53 years. He had been at the smelting plant at Pueblo for a number of years and for eight years had been chief engineer at the works.

William O'Neill died at Butte, Mont., May 29, aged 34 years. He was born at Clifton Springs, N. Y., but had lived for 16 years in Colorado and Montana, where he was widely known as a mining man.

Patrick Clark, one of the best known mining men in the Northwest, died at his home in Spokane, Wash., June 7, aged 65 years. He began active life as a miner in the Butte district and was for a number of years with Marcus Daly there. His first successful independent venture was with the War Eagle Mine in British Columbia, and later he was with Le Roi and other mines in the Rossland district. He was also concerned in several mines at the Cœur d' Alenes, and gradually acquired a large property. He operated to some extent in Nevada, at the Greenwater and other mines. His latest venture was in the Bullwhacker Mine, of which he was chief owner. For a number of years past he had made his headquarters at Spokane.

SOCIETIES

American Chemical Society—With regard to the coming annual meeting, a late circular says that the vote recently received at the secretary's office being overwhelmingly in favor of the Great Northern R.R., which stops at Glacier National Park, arrangements have been made with this road for the party to leave Chicago on Thursday, Aug. 26. One and one-half days will be spent at Glacier National Park, and Seattle will be reached Aug. 30. Aug. 31, Sept. 1 and 2 will be spent at Seattle, and on the evening of Sept. 2 the party will take a special train to Mt. Ranier National Park, where it will remain on Friday, Sept. 3, leaving there that evening and arriving at Portland the following morning; spending the day in Portland as the guests of the Oregon Section; leaving Portland Saturday night, passing through the Mt. Shasta and Mt. Lassen region on Sunday and arriving in San Francisco Sunday evening. At San Francisco the party will break up, returning by any route desired.

American Iron & Steel Association—At the annual meeting in New York, May 28, at the morning session, Andrew E. Maccoun, superintendent of the Edgar Thompson blast furnaces, Carnegie Steel Co., spoke upon "Blast Furnace Advancement." Jerome R. George, chief engineer of the Morgan Construction Co., read a paper upon "Merchant Rolling Mills." At the afternoon meeting Edward F. Kenney, metallurgical engineer of the Cambria Steel Co., spoke upon the "Commercial Production of Sound and Homogeneous Steel." Charles J. Bacon, steam engineer of the Illinois Steel Co., delivered an address upon "Waste-Heat Boilers." "Recent Progress in Corrosion Resistance" was the subject of a talk by Daniel M. Buck, metallurgical engineer of the American Sheet & Tin Plate Co. After each of the addresses an informal discussion followed under the five-minute rule.

At the dinner in the evening President E. H. Gary delivered his annual address which was generally optimistic in its tone with regard to future business. He was followed by Charles M. Schwab, James H. Hoyt of Cleveland, John A. Penton, also of Cleveland, Willis L. King, of the Jones & Laughlin Steel Co., Joseph G. Butler, Jr., of the Brier Hill Steel Co., and Mr. Haeger, of the Haeger Cement Co. Dr. Lloyd Noland spoke upon the "Welfare Work of the Tennessee Coal, Iron & R.R. Co." His address was accompanied by stereopticon slides showing the actual conditions established.

INDUSTRIAL NEWS

The Arizona Copper Mining Co., Clifton, Ariz., is installing two 48-in. Symons disk crushers.

International High Speed Steel Co., announces that its new address is the Bennett Bldg., 99 Nassau St., New York.

A meter which gives a direct reading of air consumption has been placed on the market by the New Jersey Meter Co. of Plainfield, N. J.

Sullivan Machinery Co. announces that its Juneau office has moved from the New Brunswick Bldg., to the Forest Bldg. Burt B. Brewster is manager.

The Washita Lead & Zinc Co., of Davis, Okla., is installing a 5x7-ft. Chalmers & Williams adjustable quick-discharge tube mill and a Wood's type wet screen.

A new locomotive headlight which permits the use of a tungsten filament with a mirrored glass reflector has been brought out by the Esterline Co., of Indianapolis, Ind.

The Dayton Steel Foundry Co. of Dayton, Ohio, has recently placed an order for a one-ton Snyder electric furnace. This furnace will melt and refine cold scrap on a basic lining, producing steel castings.

The Powell Valve Co., Cincinnati, Ohio, has just placed a new valve, the "Irenew" on the market. With this valve there is no necessity for disconnecting the valve from the pipe for regrinding. The seat and valve are ground in place.

The Terry Steam Turbine Co. announces the appointment of Merton A. Pocock as district sales manager for the territory in the states of Minnesota, North and South Dakota. His

office is 400 Endicott Bldg., St. Paul. Also the Hawkins-Hamilton Co., People's National Bank Bldg., Lynchburg, Va., for its representatives in Virginia.

The business of the Wells Light Manufacturing Co., Jersey City, N. J., has been acquired by the Alexander Milburn Co., of Baltimore, Md.; manufacturers of high power portable lights, and oxy-acetylene welding apparatus. Repair parts for outstanding Wells Lights will be manufactured and supplied in the future by the Alexander Milburn Co. from its Baltimore factory, and complete Wells oil lights will also be furnished where desired, in conjunction with the standard Milburn acetylene lights. The manufacture of Wells oil preheating burner outfits will be continued by the Milburn company and sold in connection with Milburn oxy-acetylene apparatus.

TRADE CATALOGS

The Deming Co., Salem, Ohio. Catalog J. Power Pumps. 19 pp., illus., 7x9 inches.

Dodge Sales & Engineering Co., Mishawaka, Ind. Catalog. Gearing. 126 pp., illus., 6x9 inches.

Hanna Engineering Works, Chicago, Ill. Catalog No. 3. Pneumatic Riveters. 64 pp., illus., 6x9 inches.

Kerr Turbine Co., Wellsville, N. Y. Bulletin No. 52. Economy Turbo-pumps. 24 pp., illus., 6x9 inches.

Hazard Mfg. Co., Wilkes-Barre, Penn. Price List. Oil and Gas Well Wire Lines. 12 pp., illus., 3½x6 inches.

The Holt Mfg. Co., Stockton, Calif. Bulletin A 60-108. Holt Caterpillar "45", 32 pp., illus., 7x10 inches.

Chalmers & Williams, Inc., Chicago Heights, Ill. Catalog N. Tube and Ball Mills. 36 pp., illus., 7x9 inches.

Cresson-Morris Co., Philadelphia, Penn. Form No. 1001. Barometric Condensers. 28 pp., illus., 9x12 inches.

The C. D. Pruden Co., Baltimore, Md. Loose Leaf Catalog. Portable Steel Buildings. Illus., 8x11 inches.

Scranton Pump Co., Scranton, Penn. Bulletin No. 102. Duplex Plunger Pumps. 12 pp., illus., 6x9 inches.

The Jeffrey Mfg. Co., Columbus, Ohio. Bulletin No. 141. Single Roll Coal Crusher. 32 pp., illus., 6x9 inches.

Denver Engineering Works Denver, Colo. Bulletin No. 1072. Isbell concentrator. illus., 8½x11 inches.

The Marion Steam Shovel Co., Marion, Ohio. Catalog No. 93. Marion Reliability and Your Profits. 48 pp., illus., 5½x8 inches.

Link-Belt Co., Philadelphia, Penn. Wagon and Truck Loaders for Coal, Coke, Stone, Sand, etc. 48 pp., illus., 6x9 inches.

Link-Belt Co., Philadelphia, Penn. Bulletin No. 221. Circular Storage System for Storing Coal, etc. 4 pp., illus., 6x9 inches.

The Statistics Bureau, 5 E. 42d St., New York. Catalog Materials for the Graphic Presentation of Facts. 20 pp., illus., 6x9 inches.

Turbo-Gear Co., Industrial Building, Baltimore, Md. Catalog A. Turbo-gear. Speed Reducing or Speed Increasing Gear. Illustrated.

Myers-Whaley Co., Knoxville, Tenn. Catalog No. 5. Shoveling Machines for Underground and Surface Work. 28 pp., illus., 8½x10 inches.

Kennedy-Stroh Corp., 120 Broadway, New York. Catalog Section B. Ore Milling, Cyaniding and Smelting Machinery. 86 pp., illus., 6x9 inches.

Chalmers & Williams, Inc., Chicago Heights, Ill. Bulletin, Section T. Modern Crushing Machinery. 16 pp., illus., 7x9 in. Section R. Symons Disk Crusher. 24 pp., illus., 7x9 inches.

Byron Jackson Iron Works, Inc., San Francisco, Calif. Bulletin No. 52, Exposition Edition. Useful Engineering Data Pertaining to Pumping Problems. 48 pp., illus., 6x9 inches.

W. A. Butchart, Denver, Colo. Bulletin No. 1. Butchart Riffle System. 16 pp., illus., 6½x9½ in. Bulletin No. 2. Butchart Concentrating Table. 18 pp., illus., 6½x9½ inches.

Chicago Pneumatic Tool Co., Fisher Building, Chicago, Ill. Bulletin No. 34-U. Instructions for Installing and Operating Class N-SO Fuel Oil Driven Compressors. 24 pp., illus., 6x9 inches.

Sullivan Machinery Co., 122 S. Michigan Ave., Chicago, Ill. Bulletin No. 66-G. Air-feed Stoping Drills. 12 pp., illus., 6x9 inches. Blue Booklet No. 115. Air compressors. 32 pp., illus., 3x5½ inches.

Campbell Magnetic Separating Co., 141 Milk St., Boston, Mass. Catalog. The Campbell System of Magnetic Separation for the Treatment of Zinc, Iron Sulfid Ores and Table Middlings. 8 pp., illus; 6x9 inches.

Spray Engineering Co., 93 Federal St., Boston, Mass. Bulletin No. 101. Sprays for Cooling Condensing Water. 14 pp., illus., 6x9 in. Bulletin No. 151. Washing and Cooling Air for Steam Turbine Generators. 8 pp., illus., 6x9 inches.

The Jeffrey Mfg. Co., Columbus, Ohio. Bulletin No. 165. Wagon and Truck Loaders for Crushed Stone, Sand, etc. 16 pp., illus., 6x9 in. Bulletin No. 166. Wagon and Truck Loaders for Bituminous and Anthracite coal. 24 pp., illus., 6x9 inches.

The Lidgerwood Manufacturing Co. has just issued a leaflet describing a small mine hoist which stands only 2 ft. 3 in. high, although the drum holds 1000 ft. of ⅜-in. rope or 800 ft. of ½-in. rope. It is equipped with a 5-hp. motor, for either a.-c. or d.-c. current, as ordered.

Sullivan Machinery Co., Bulletin 65-C. Sullivan Diamond Core Drills. 36 pp., illus., 6x9 in. This bulletin gives not only information relating to Sullivan core drills but also general advice on diamond drilling that should be of value to anyone contemplating such work. The bulletin gives detailed lists of equipment comprising a wide range of diamond-drilling outfits, together with prices for the complete outfits and for the various parts.

NEW PATENTS

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

CLASSIFIER and Dewaterer. Walker J. Boudwin, Salt Lake City, Utah. (U. S. No. 1,140,793; May 25, 1915.)

CLASSIFIER—Rotary Classifier. Charles O. Michaelsen, Omaha, Neb. (U. S. No. 1,140,700; May 25, 1915.)

CONCENTRATOR. Charles F. Paige, Oakland, Calif., assignor of one-third to Adolph W. Jones, Oakland, Calif. (U. S. No. 1,140,764; May 25, 1915.)

COPPER—Process of Extracting Copper from a Sulphate Solution. Noak Victor Hybinette, Christiansand, Norway. (U. S. No. 1,140,682; May 25, 1915.)

DRILL—Hand Drill. Joseph Buscavage, Tamaqua, Penn. Filed Nov. 18, 1914. (U. S. No. 1,140,572; May 25, 1915.)

DRILL BITS—Machine for Making and Sharpening Drill Bits. Samuel V. Rawlings, Calumet, Mich. (U. S. No. 1,140,396; May 25, 1915.)

FLOTATION of Minerals. Raymond F. Bacon, Pittsburgh, Penn., assignor to Metals Research Co., New York, N. Y. (U. S. No. 1,140,865 and 1,140,866; May 25, 1915.)

FUEL—Furnace Stoker for Feeding Coal-Dust or Other Comminuted Fuels. Charles L. Heisler, Schenectady, N. Y. (U. S. No. 1,140,817; May 25, 1915.)

FUEL—Process for Converting Fine Coal Into a Marketable Fuel. John Evans, Melbourne, Victoria, Australia. (U. S. No. 1,140,735; May 25, 1915.)

GALVANIZING—Method of Galvanizing. William Gibson, Sr., Vandergrift, and Robert Skemp, Scottdale, Penn., assignors to American Sheet & Tin Plate Co., Pittsburgh, Penn. (U. S. No. 1,140,898; May 25, 1915.)

HARDENING IRON—Process of Hardening Iron. Santiago Luis Brown, New York, N. Y. (U. S. No. 1,140,568; May 25, 1915.)

ORE CAR. William C. Carr, Buffalo, N. Y. (U. S. No. 1,140,497; May 25, 1915.)

ORE-POCKET DOOR. Charles G. Baumgartner, Chicago, Ill. (U. S. No. 1,140,436; May 25, 1915.)

PHOSPHATE ROCK—Apparatus for Washing Phosphate Rock. George L. Davison, Mountpleasant, Tenn., assignor to Ruhm Phosphate Mining Co., Mountpleasant, Tenn. (U. S. No. 1,140,962; May 25, 1915.)

PYROMETERS—Protecting Hood for Thermo-Couples. Andrew F. Mitchell, Homestead, Penn. (U. S. No. 1,140,701; May 25, 1915.)

SINTERING—Apparatus for Sintering Ores. Albert F. Plock, Pittsburgh, Penn., assignor to the Pittsburgh Metallurgical Co., Inc., Pittsburgh, Penn. (U. S. No. 1,140,710; May 25, 1915.)

STEEL—Process for Making Steel. George E. Weissenburger, Berlin, Germany, assignor of one-half to Otis Elevator Co., New York, N. Y. (U. S. No. 1,140,550; May 25, 1915.)

TIN—Apparatus for Detinning Tin Scrap, Boxes, or the Like. Hans Goldschmidt, Essen-on-the-Ruhr, Germany, assignor by mesne assignments to Goldschmidt Detinning Co., New York, N. Y. (U. S. No. 1,139,410; May 11, 1915.)

TUNNELING MACHINE. Walter W. Giggey, Netherland, Colo. (U. S. No. 1,140,673; May 25, 1915.)

WELDING—Art of Welding. Marshall Burns Lloyd, Menominee, Mich., assignor, by mesne assignments, to the Elyria Iron & Steel Co. (U. S. No. 1,141,068; May 25, 1915.)

VENTILATION—Safety Means for Humidity-Regulating Apparatus. Willis H. Carrier, Buffalo, N. Y., assignor to Buffalo Forge Co., Buffalo, N. Y. (U. S. No. 1,138,084; May 4, 1915.)

WIRE ROPE. Telford Clarence Batchelor, Hay Mills, near Birmingham, England. (U. S. No. 1,137,690; Apr. 27, 1915.)

Editorial Correspondence

SAN FRANCISCO—June 2

Eruptions of Mud from Mt. Lassen have given rise to reports that lava is flowing from the "crater." There is no crater and no lava. The fissure which was widened last summer by the eruptions that attracted a large amount of unscientific and a small amount of scientific interest, has continued to widen as the result of numerous blowouts until the walls, softened by melting snows and rains, have become masses of mud. The extraordinary weather in May included Mt. Lassen in its unwelcome visits, and the big peak has imitated some of its small neighbors by developing into a mud spring, though on much larger scale. The large amount of mud blown out from the fissure has endangered the lives of the stock in the vicinity and scared some of the farmers stiff. Congressman Raker may now cease from his strenuous labor to have created a national park, including Mt. Lassen. Mud springs are only good for rheumatism. Not at all attractive to tourists.

The Brown Bear Leasers, who for several years industriously worked this once famous mine, have gone and the Deadwood post office has been removed to Lewiston. Deadwood was once one of the livest camps in Trinity County. The Brown Bear was a large producer down to the 450-ft. level, being variously credited with from $5,000,000 to $9,000,000. The gold in the top was free, but at the lower levels was refractory, and while some concentrates were saved a large amount of metal was washed away in the tailing from the 15-stamp mill. About 15 years ago a new development tunnel was driven 500 ft. lower than the old workings and a new mill installed before the new ore was developed. Various efforts were made to bring the old mine back to its former productive capacity. The old work was completed and the new work begun about the time that cyanidation was introduced in Shasta and Trinity Counties by Almarin B. Paul. It was difficult to persuade managers of such mines as the Brown Bear that cyanidation could save their values; and in many cases, as in the case of the Brown Bear, they were so wedded to the stamp mill and concentration tables that they believed no other method, except perhaps smelting, could give them better returns. They were of the old school of superintendents whose relics and wrecks are scattered over a large territory. The five families remaining are the relics and the Brown Bear mine will soon be the wreck that Deadwood contributes to the long list. Here is an opportunity for some live young mining engineer to do a little prospecting from which he can at least gain experience, and stand a possible chance of introducing investors who are not afraid of experimenting with modern metallurgical methods.

Resumption of Copper Mining at the Balaklala Mine, Shasta County, is probable. Whether smelting at Coram will be resumed or the ore shipped to Tacoma and Kennett is at present not known. Frank M. Leland, manager of the Balaklala and the Trinity mines, recently visited Coram and is reported to have stated that mining would be immediately resumed, but gave out no particulars. There was, some months ago, a prospect that the Heslewood hydro-vacuum process would be tried out at the smeltery. But at present nothing definite has developed. During the time that Mr. Leland was at Coram and San Francisco it was reported that the Mammoth Copper Co. was considering the purchase of the Balaklala and the Trinity mines. The present holdings of the Mammoth almost wholly surround the Balaklala and part of the Trinity. The original Mammoth mine was situated on the south side of Little Backbone Creek about four miles west of Kennett and seven miles northeast of Iron Mountain mines of the Mountain Copper Co. The Mammoth has steadily increased its holdings and in 1914 acquired several large properties more or less developed. In the present year other properties have been added and still others are said to be contemplated. Should the Balaklala and the Trinity be taken over by the Mammoth it would be but a short time before the entire developed and prospected properties in the west-side copper belt of Shasta County, with the exception of the Mountain Copper Co. holdings, would come into possession of the Mammoth. Such accumulation of copper mines would form an ideal opportunity for the mining and smelting of copper on an immense scale. Whether the Mammoth is "out of the woods" in its relation to the farmers of Shasta County or not, the situation at present is sufficiently assuring to warrant the advancement that has marked the conduct of the company in the past two years. At any rate the Mammoth has shown that it is in better position than any other of the copper mining companies who undertake the smelting of ores in Shasta County. Even with the acquisition of the properties in question and the enlargement of smelting facilities on a scale made possible by this probable advancement, it is not believable that the farmers will entirely refrain from further annoyance; but from both legal and industrial points of view the Mammoth Copper Co. would be in a stronger position to withstand such attacks than it has ever been.

DENVER—June 3

Tungsten Ore or Concentrate running 60% WO_3 is now worth $540 per ton. On June 2, the Primos Chemical Co. announced at Boulder that it would pay $9 per unit for this grade of material. Tungsten miners are "getting busy."

There Will Be Paid Approximately $484,700 during the next three years as indemnities to employees in metalliferous mines of this state, according to estimates based upon statistics of mine accidents durng past three years, by Fred Carroll, new state commissioner of mines, as a result of the new provisions of the workmen's compensation act passed at the last session of legislature.

Zinc—American Smelting & Refining Co. is adding a new furnace to its zinc-smelting plant at Blende, near Pueblo, thereby making a total battery of nine furnaces with an aggregate daily capacity of 110 tons ore. Company is also adding six furnaces to its plant at Sand Springs, Okla. New Jersey Zinc Co., probably largest purchaser of zinc ore in Colorado, working its smelteries at full capacity. Average settlement price in this state last week was on basis of $13.42 for spelter, but this represented very limited tonnage. Smelting concerns claim they are overstocked with ore, the Empire company stating that its own mines produce all the ore the plants can smelt.

Two Interesting Lawsuits were tried last week in the district court at Leadville. One, involving the Hellena mine in Iowa gulch, was brought by numerous creditors who pooled their interests and were represented by a local hardware company. Evidence showed that the Hellena company spent about $45,000 in development and pumping while marketing $16,000 worth of ore. This is an instance of wrecking a promising mining enterprise through lavish expenditures by an ignorant, tenderfoot management sent from Eastern headquarters, in this case, Pittsburgh, Penn. The other case was brought by parties who were former partners in a lease on the M. N. claim, a fractional tract on Breece Hill surrounded by the Ibex group otherwise known as the Little Jonny. These parties left Leadville in 1897, subsequently writing that they did not care to be counted as partners in a renewal of the lease and declining to stand their pro rata of expenses in dead work. But, the presiding judge remarked, this suit was "an after-thought" consequent on the M. N. lease having developed into a profitable mine. The decision was given against the "quitters."

BUTTE—June 2

The First Prize of $750 offered by the Anaconda company to the foreman of the mine that made the best showing in accident records for the year ended Mar. 31, 1915, went to Thomas McGrath of the West Gray Rock mine. The second prize was awarded to John Peters of the Poulin mine. The total number of accidents in all of the Anaconda company's Butte mines during the year was 185.

Following the Dissolution of the Amalgamated Copper Co. and the taking over of the Amalgamated holdings by the Anaconda company, the organization has been adjusted so as to include those who were active in the management of both. John D. Ryan, former president of the Amalgamated, becomes the president of the Anaconda company. B. B. Thayer, who was president of the Anaconda company, becomes one of its vice-presidents. C. F. Kelley remains as

vice-president and managing director. The duties of Messrs. Ryan, Thayer and Kelley will be practically the same as they were under the dual company arrangement. Mr. Ryan will remain at the head of the affairs in New York and Mr. Thayer will be practically the managing head of the operating department of the Anaconda company with Mr. Kelley in direct charge and with headquarters in Butte.

The Balance of the Electrification of the Chicago, Milwaukee & St. Paul Railway from Deer Lodge, Mont., to Avery, Idaho, will be started by Aug. 15, and will complete the work for which an appropriation of $13,000,000 has been made by the road for the greatest electrical construction work in the world. Announcement was made of the decision after a visit over the line by C. A. Goodnow, assistant to President A. J. Earling. Several crews have been put to work in the field west of Deer Lodge to survey for the transmission lines that will carry the power from the main feeder lines to the sub-stations that are to be put in. The sites for the sub-stations have already been selected; there will be seven between Deer Lodge and Avery. A similar number are now under construction on the first section of the electrification, between Harlowtown and Deer Lodge. The first section of 238½ miles will be completed by the end of the present year, if the present rate of progress in the work is maintained. The second section of the work will cover 212 miles more, making a total of 450½ miles. Alberton, a station midway between Deer Lodge and Avery, will be the pivotal point in the new district, and from there power will be supplied from the Thompson Falls plant of the Montana Power Co., which is now also nearing completion.

SALT LAKE CITY—June 4

The Salt Lake Stock & Mining Exchange during May traded in 1,136,301 shares of stock valued at $279,838.59 compared with 2,040,603 shares at $463,655.65 during April and 1,890,690 shares at $303,051 during March.

University of Utah Muddle—The committee of 25, appointed by the Alumni association of the University of Utah to investigate the university trouble, decided that in its opinion the only solution to the problem is for the majority of the board of regents of the institution and President Kingsbury to tender their resignations forthwith.

SEATTLE—June 1

Survey Coal Fields. Frank M. Johnson, supervisor of surveys for the U. S. Land Office states that the department will have 16 parties in the field in Alaska this summer making surveys of the Nenana, Matanuska and Bering River coal fields, the first two parties under his direction having sailed from Seattle for the north the latter part of May. One party consists of 19 men and the other of 10. They will go down the Yukon River to Fairbanks and thence to the Nenana fields. Other parties will leave later to make surveys of the other fields.

A New Gold Creek is being opened on the Upper Yukon according to the news brought out from Kirkman Creek where 60 prospectors getting out small dumps all last winter have just cleaned up since the thaw. Since spring has enabled work to proceed, a pay streak of good dimensions has been exposed. Many of the operators are so well satisfied with the creek that they have made their way to Dawson for outfits and several boilers are now on the way into the district. The ground runs about 4c. to the pan though Turner, Smith & Bell on the Cooly association took out $110 in four days' sluicing.

Eight Hours for Placer Miners has now been written into the Alaska mining laws by the passage by the legislature of a bill recently when they receded from the amendment to the eight-hour quartz bill whereby placer miners were excluded from the workings of the eight-hour law and the bill as passed and signed by the governor applies to mining of every description. The placer-mine owners made a great fight to have their properties excluded from the bill, claiming that the season was too short, and the difficulties so great in many sections of Alaska, that it would have the effect of putting them out of business and for a time a majority of the members of the house were inclined to make an exception in their favor. The law provides severe penalties for infringement and involves both fine and imprisonment for all mine owners who work or attempt to work their men more than eight hours per day. The law became effective on the signing of the bill.

The Removal of Federal Mine Inspector and the retention of the territorial mine inspector, at an increased salary, by the legislature has caused severe criticism in Alaska. Many of the operators maintain that it is more advantageous for many reasons to retain the federal mine inspector who is no expense to the territory and dispense with the services of the territorial mine inspector. As it is now the territory has two mine inspectors who do practically the same work in the same territory. Last year for example the Fairbanks district was visited by two inspectors, one in the employ of the federal government, under the jurisdiction of the Bureau of Mines, and the other the territorial mine inspector. The two officials went over the creeks together, gathering data and informing operators of the requirements of the law under which the mines are inspected. It is maintained that one official could have done the work, and it would have been done without expense to Alaskans. It is claimed that the work by the federal department is far more satisfactory, being carried on by a more experienced body than that of the territory.

Activities in the Tolovana District have disclosed pay that establishes the district as a paying camp which has been in doubt since the first reports of the discovery of gold. Ester Creek, Olive Creek, Tolovana, Wilbur Creek and others have now well defined pay streaks and the future of the camp is assured though just what the district will develop will not be known until later in the summer when much of the ground will be uncovered. On Olive Creek a paystreak more than 200 ft. wide has been located and extends along the creek a distance of about 1000 ft. Bedrock is 20 ft. from the surface and the pay runs about $3 to the foot. On Ester Creek which empties into Livengood on which a pay streak of $2 value has been uncovered, there is considerable work being done and pay averaging $1.50 to the foot is being taken out. On Livengood Creek on the left limit from 9 and 10 Above to 4 Below, pay that will average from $1.25 to $1.50 to the foot has been located. Bedrock in some places shows 6 ft. of gravel running 3c. to the pan. On Wilbur Creek, on Discovery claim, the ground is good enough to work judging by the number of outfits that are busy sluicing dirt. On 4 Below Mike Hess Creek, Hans Larson struck pay running 2c. to the pan of which there is a well defined streak averaging about 7 ft. in depth. The distance to bedrock is about 50 ft. That the district is well considered by operators in the north is proved by the fact that several options have been taken up and paid; the most notable change of property being that to Pierson & Johnson of the Hidden Treasure and Baltic association claims for $10,000. They are located on the right limit of Livengood creek. The Deep Channel association claim owned by Cascaden & McCord has been optioned by Harry Patterson.

TORONTO—June 5

The Tonnage of Ore Milled at Cobalt during 1914 was 80,000 tons greater than during 1913, according to A. A. Cole in his review of the mining industry of Northern Ontario. Seventeen mills treated 743,531 tons of ore; total concentrates shipped 12,682 tons; total bullion, 3,847,806 ounces.

The Draining of Cobalt Lake by the Cobalt Lake Mining Co. which owns the Cobalt Lake property is under way. Cobalt Lake has an area of 57 acres and contains 500,000,000 gallons of water. The town of Cobalt used the water in the lake for fire purposes; the N. O. L. & P. Co. electric plant used the water for cooling its transformers, etc.; while, about 3000 gallons per min. were being pumped to supply four concentrating mills. It was arranged between the interested parties to discharge the water into a gully which would carry it to Farr Creek and thence to Lake Timiskaming. The scheme of dewatering the lake presupposed the conservation of all the run-off in the water shed of Pickerel Lakes and Bass Lake, to the south, and comprising 970 acres, and to pipe and flume it to a reservoir where it could be carried to the various mills. To this end a pumping station was built on the North shore of Bass Lake, discharging into South Pickerel Lake. The discharge is through 1260 ft. of 16-in. wire-wound wood-stave pipe. In order to lift the conserved water from the Pickerel water shed, a pumping plant, similar to that at Bass Lake, was placed on a scow at the north end. The discharge, working against a 55-ft. head, is through 1270 ft. of 16-in. wood-stave pipe, and carries the water to the highest points between Pickerel and Brief Lakes, and from thence the water flows through a 2-sq.ft. flume for 1560 ft., to Brief Lake, which is in the Cobalt Lake watershed, and from Brief Lake the water flows by gravity through an opencut, 1600 ft. long, to Short Lake, 22 ft. below the level of Brief Lake. This latter lake is used as a storage reservoir and distributing point for the water-supply of the various concentrating mills. Cobalt Lake is drained by two centrifugal pumps, mounted on a scow, anchored in the deepest part of the lake, near the northern shore. These pumps have a capacity of 3500 gal. per min, against a 100-ft. head. The discharge is through two 20-in. flexible joints, one on the scow, and one on a crib at the shore, permitting an angle of movement of 20 deg., into a 20-in. wood-stave pipe, 3500-ft. long. The whole work is expected to be completed this month.

The Mining News

ALASKA

ALASKA UNITED (Treadwell)—In month of April crushed 43,799 tons ore. Estimated gross value, $88,507; yield per ton ore milled, $2.

ALASKA TREADWELL (Treadwell)—In month of April crushed 75,212 tons ore. Estimated gross value, $140,278.77; yield per ton ore milled, $1.86.

ALASKA MEXICAN (Treadwell)—In month of April, operating 29½ days, crushed 18,830 tons ore. Estimated gross value, $33,932.31; yield per ton ore milled, $1.80.

ARIZONA

Gila County

GIBSON (Miami)—George Zapp and Lou Riddle, lessees, recently shipped 40 tons of 39.18% copper ore to smeltery. They also shipped similar quantity of low-grade silver-ore to El Paso plant and are preparing to continue these shipments regularly.

ARIZONA COMMERCIAL (Globe)—Will ship most of its ore to Douglas instead of Old Dominion smeltery because latter cannot treat more sulphides than its own mines produce. Copper Queen plant will treat 120 tons and Old Dominion about 50 tons per day.

IRON CAP (Globe)—Stope on 800 level has reached Arizona Commercial property line on east, where it is still in ore of good grade, and stoping upward is now proceeding all along the orebody, 500 ft. in extent. Drifting on 1300 level of western group of Arizona Commercial is making toward old workings on Iron Cap, where flow of water formerly proved more than they could cope with. Manager Woodward of Iron Cap believes this work of Arizona Commercial will reveal ore up to side lines of his company's property.

Mohave County

BLACK RANGE GOLD (Kingman)—Company was recently reorganized and will install new machinery at its mines.

UNION BASIN (Golconda)—N. L. Amster and associates have purchased Golconda zinc mine and will enlarge concentrator and add to equipment of property. Ore will be shipped to zinc smeltery at Bartlesville, Okla.

WALKOVER (Kingman)—Has been optioned to A. F. Frazer and associates by Messrs. Carney and Jepper, the prospective purchase price being $50,000. Considerable ore has been shipped to smelteries during last three years.

Yavapai County

MINICA (Kirkland Valley)—Debenture Units Mining Co. of Los Angeles has repaired 20-stamp mill at Minica mine near Kirkland Valley and will soon begin development operations on large scale.

CALIFORNIA

Amador County

MONTE DE ORO (Plymouth)—T. Jenkins has concluded arrangements with Levaggi Estate Co., owners, to operate this mine on royalty.

Butte County

VAN WINKLE (Oroville)—J. J. Riley, of Reno, Nev., reported to have sold one-fourth interest in this mine on north fork Feather River to Eastern men. Will develop with compressed air drills.

Calaveras County

PEREIRA (Jamestown)—Mrs. C. W. Miller, owner, has bonded the mine to men who propose extensive development.

Eldorado County

BLUE ROCK (Georgetown)—James Flynn is preparing to install 10-stamp mill.

BEEBE (Georgetown)—Mine will be unwatered and development work prosecuted. Shaft is down 180 ft. J. H. Robinson of San Francisco is owner.

PACIFIC (Placerville)—One of leases reported to have been sold to J. E. Oliver, said to be connected with an English company operating in South Africa. New oreshoot disclosed on the 500 level. Development is in progress.

Inyo County

WILSHIRE BISHOP CREEK (Bishop)—Assays reported to run from $14 to $50 per ton for high-grade and $14 for low-grade. Veins run from 8 in. to 5 ft.

NEW COSO (Coso)—Property known as Lucky Jim mine was sold at Independence by sheriff to satisfy judgment held by Inyo County Bank, Charles A. Collins and Walter B. Young. Mr. Young bought the property for $16,000.

CASA DIABLO (Bishop)—The 10-stamp mill is being overhauled and rebuilt. Cyanide plant will also be operated in connection with stamps. Ore is being extracted from several tunnels. Small amount of rich ore has been developed. Average will be about $40 per ton. John Taylor is operating under lease.

Kern County

YELLOW ASTER (Randsburg)—Action for control has been brought in the Superior Court at Los Angeles by Mrs. de Pauw, formerly Mrs. John Singleton. Mrs. de Pauw wishes to oust Ward Chapman from position of executor of Singleton estate and to have her husband, Count Cornelius G. A. M. de Pauw, of Holland, made president and general manager. Since death of Mr. Burcham about two years ago and death of Mr. Singleton about a year ago, Dr. Rose L. Burcham has managed financial department of Yellow Aster, and mine has continued prosperous. Placing property under control of Count is not desired by those who have contributed to its success.

Modoc County

VERAVALE (Cedarville)—Reported that new mill is to be installed. Experiments with ores in this district said to have proved that Call method is successful in handling refractory high-grade ores.

Nevada County

BRUNSWICK (Grass Valley)—In addition to installation of 20-stamp mill and steel headframe, small cyanide plant is contemplated.

CALIFORNIA (Grass Valley)—Surface plant, including mill, hoist and headframe, destroyed by fire. Believed to have been incendiary. E. S. de Golyer, San Francisco, manager.

NORAMBAGUA (Grass Valley)—Property reopened after being idle several years. Will require about two weeks to unwater shaft. George Campbell of San Francisco is owner.

MAJOR (Nevada)—Expected this gravel mine on Cement Hill will be reopened in June. Company has secured permit from "blue sky" commission to dispose of stock to be used for development. J. B. Proctor of Grass Valley is president and manager.

WILLOW VALLEY MINING CO. (Nevada City)—Three properties, Willow Valley, Montana, and Northern Montana, have been consolidated and will be operated by this company. Stamp mill is in operation but high-grade refractory ores are shipped to smeltery. Reported that assays show from $21 to $58 per ton. C. W. Hornick, J. L. M. Shetterley, W. E. Wright and Arthur W. Hoge are the principal members of the company.

PENNSYLVANIA CONSOLIDATED (Grass Valley)—Payments of $3 per share made to stockholders who sold mine to Pennsylvania Mines Syndicate, who are also owners of the Empire mine. The amount distributed exceeds $200,000, and about one-half of this goes to local residents. They have previously been paid about $60,000. Balance due on property is about $240,000, which is to be paid by May, 1916.

Placer County

HERMAN (Westville)—Installation of electric power plant is contemplated. Mine formerly known as Barton. Pennsylvania Gold Mining Co., owner.

RIP VAN WINKLE (Auburn)—Installation of small stamp mill this summer is contemplated by B. S. Buckman, owner.

BLACK OAK (Weimar)—Mine being reopened. Machinery will be installed as soon as retimbering is completed. E. Bell of Auburn is superintendent.

FEDERAL (Dutch Flat)—Machinery and material are being brought in for driving tunnel under town, starting at point near old brewery. Practically all owners of surface property in the town have agreed to proposition made by company. This company is also operating Gray, Cedar Creek, and Uren mines.

Plumas County

LAFAYETTE DRIFT GRAVEL MINING CO. (Marysville)—Incorporation with capital stock of $50,000. The directors are L. J. Williams, F. J. Shields, F. W. Loehne, Byron Jakes of Marysville, and F. J. Savage of Vallejo. Company organized to operate drift mines which have been worked for last two years by Shields and Williams.

ENGELS COPPER (San Francisco)—Report to stockholders states that mill has produced to April 30, 1915, 1446.87 tons concentrates, of which 56.50 tons has been marketed. Copper content averaged 36%; gold and silver approximated $5.50 per ton. Net balance of indebtedness Apr. 30, $21,153, reduced from $104,728. Value of concentrates on hand estimated to be equal to present indebtedness. Mine is situated near Taylorsville.

SENECA CONSOLIDATED (Seneca)—J. J. Riley, who has been operating Del Monte, White Lily, and other claims in consolidation, has sold one-fourth interest to Eastern men and first payment of $20,000 is said to have been made. Power drills will be installed and 1000 ft. of tunnel driven. Shaft is contemplated below the level of north fork of Feather River on White Lily claim. This property has 10-stamp mill in operation. M. S. Brandt of Boulder is superintendent.

Santa Barbara County

LOMPOC DIATOMACEOUS EARTH quarries near Miguelito Cañon will be opened up by C. D. Armstrong, Jr., J. M. Salsbury and Thomas Mathews, members of the Armstrong Cork Co. of Pittsburgh. The property comprises 300 acres in the Oliver tract, which is called the John Starr place. The material will be shipped to Pittsburgh for treatment.

Shasta County

VICTOR POWER & DEVELOPMENT (Knob)—Preparations reported for installation of hydro-electric power plant to operate Midas mines in Harrison Gulch district.

Siskiyou County

HOMESTAKE (Etna)—Operation resumed after idleness of nearly two years. Installation of milling plant this summer is contemplated. John Boyle is superintendent.

VICTOR GOLD (Etna)—Reported that order has been placed at Los Angeles for new 50-ton mill including tube mill, concentrators, rock breaker and Challenge feeder. John Nefroney is superintendent.

BLUE JEANS (Etna)—Face of 130-ft. tunnel is in good ore; vein stands nearly vertical. If further development warrants, 10-stamp mill will be installed. There is abundant water for milling. Siskiyou Syndicate is owner.

INDIAN GIRL AND NIGGER BOY (Hornbrook)—Frank Rose, representing Canadians, has taken options on these properties on Ash Creek, and Ash Creek Mining Co. has been formed to develop them. Indian Girl is noted pocket mine, having produced approximately $200,000. The 6-stamp mill is in operation. Air compressors and drills will be installed.

COLORADO

Boulder County

HERALD (Sugar Loaf)—Boulder business men have taken lease from John Yates and struck 2-ft. vein of rich gold-silver ore.

GOLD HILL (Gold Hill)—Has struck 5-ft. shoot of $50 ore in blind vein at 2200 ft. from portal of adit. Now probable that mill built prematurely on this property by promoters of company will find use.

Clear Creek County

ONEIDA (Idaho Springs)—Mill running past month on $4 ore broken during development. Has opened 30-in. shoot of ore running about 1 oz. gold and 3 oz. silver.

NEW ERA (Idaho Springs)—While development is being pushed in three different parts of mine, dump is being milled and shows an average gross value of about $6 per ton.

VINDICATOR (Idaho Springs)—Gold Standard Leasing Co. is taking over properties and has let contract for 50 ft. of drifting in the Tom Tuck vein. Casper, Wyo., and San Francisco persons comprise the new company.

STANLEY (Idaho Springs)—James Myers, of Golden, is drifting on bedrock under the alluvial deposit close to and under Clear Creek immediately below the mine dumps. He recently cleaned up nearly 20 oz. of gold in a five days' run. He is sinking another shaft and is using a 3-in. centrifugal pump to handle seepage.

Dolores County

SILVER SWAN (Rico)—Day & Arms are storing complex lead-zinc ore that requires mill separation before shipment.

CATSKILL (Rico)—J. W. Burns, owner, in driving crosscut adit, encountered vein assaying 20% copper, 8 oz. silver and 0.10 oz. gold.

EMMA (Rico)—This old and at one time splendidly equipped mine, property of A. E. Reynolds of Denver, after idleness for number of years, is being reopened by leasers. Mill should be remodeled and reasonable amount of capital expended in exploring strong vein.

Gilpin County

WEST BAKER (Central City)—Electric cables have been strung down from surface of Quartz Hill through old stopes to hoist just installed on San Juan tunnel level at depth of 225 ft. Winze being sunk in ore.

IRON CITY MILL (Black Hawk)—Is closed down during remodeling and enlargement of equipment that will increase capacity to 100 tons daily. New stamps, tables and regrinding apparatus will be installed under contract by Peter McFarlane.

Lake County

DOCTOR (Aspen)—Leasers, in 25-ft. prospect hole, have struck abundance of 30% zinc ore and are making arrangements to market it.

LITTLE CHIEF (Leadville)—Austin Blakey has struck another large body of zinc carbonate and has made first shipment—100 tons—to local smeltery.

PONSARDINE (Leadville)—Leasers ship about 50 tons per week of carbonate ore running 20 to 26% zinc. In an old drift recently unwatered by Penrose pumping project, leasers found large body of galena and sphalerite exposed by caving of old walls.

BIG FOUR (Leadville)—Contracts have been secured whereby this mine can be developed and operated through Yak tunnel. A 700-ft. lateral will be driven through Ibex ground and will cut Big Four at about 1000-ft. depth. Upraise will then connect with present shaft.

San Juan County

AMERICAN OIL FLOTATION CO. (Silverton)—Force of men remodeling Silver Lake mill and installing flotation apparatus. S. A. Rodgers is repairing and putting into commission long flume from Animas River and old electric-light plant in order that this company may generate its own power. Both mill and power plant should be ready for service within a month. Mine Superintendent Louis Schafer is pushing development in Champion mine near town and in the Mayflower mine, Arastra Gulch, hoping to provide ore supply to mill.

KANSAS

MIKE GRUMLY who has lease on Schmidt Bros.' 40 acres northeast of Galena is installing pumps to drain ground, which he expects will take about two months; in meantime he will conduct a drilling campaign to test out some ground on this 40 that has never been developed, but is thought to be rich in mineral. Grumly stated he would remodel mill and put in new sand tables.

PROUTY & CO. (Galena)—On Promoter land is sinking new shaft on head of one of drifts and when completed will move its steam hoist and other machinery to it in order to avoid running its dirt so far.

PROMOTER (Galena)—Remodeling mill and installing two new sludge tables and fine screen to handle sand that runs off in waste water. It expects recovery of about 10% from this sand which formerly was lost. Mill will be down for about two weeks.

GEORGE McCOLLOUGH (Galena)—Has taken lease on Owl tract west of Galena, and has installed steam pumps to drain ground. He will lease to miners on royalty basis, and run their ore over his mill on Duck Pond lease which joins that of Owl.

GRAY CAT (Galena)—On Wyandotte land south of Galena, has opened up mine from which it is making car load of zinc concentrate per week. Mr. A. Cutright, superintendent of mine, stated that mine was in good condition and that more ore was blocked out than ever before in history of mine. He expects to make some repairs on mill in few weeks and enlarge jig capacity.

MINNESOTA

MAY ORE SHIPMENTS—Total shipments of iron ore for May, 1915, from head of Lakes aggregate 3,939,456 tons as against 1,595,341 for same period last year. Thus far, 1915 leads 1914 by 2,653,502 tons. New 55c. ore rate which went into effect recently should result in increased production on part of independent operators. Great Northern Properties are sending out about 50,000 tons daily. Duluth, Missabe & Northern road is handling about 60,000 tons per day. Mahoning, Leetonia, Grace, Aura and Commodore are putting out 800 car loads every day.

Cuyuna Range

BARROWS (Barrows)—N. P. Ry. constructing spur to shaft site. Sinking will start soon.

BRAINERD-CUYUNA (Brainerd)—Sixteen hundred-gallon electric pump being installed. Crosscutting from shaft well under way and management plans to begin hoisting ore by June 20.

CUYUNA-SULTANA (Ironton)—Three and one-half acres from southern part of property leased to Mahnomen Mining Co. and will be stripped in conjunction with orebody of latter company. Acreage leased is an extension of Mahnomen deposit and is not main deposit of Cuyuna-Sultana Co., which is in northerly part of property.

Mesabi Range

QUINN-HARRISON (Nashwauk)—Great Northern Power Co. has completed electrification of this mine except shovels operating in pit.

HULL RUST (Hibbing)—This large mine of Oliver company is sending out nine train loads of ore per day from pit. This is more than was moved daily last year.

DEAN (Buhl)—Shipments were started from here June 1. It is hoped to get out 300,000 tons this year. Property was recently electrified throughout.

CORSICA (Gilbert)—Wooden shaft destroyed by fire last fall has been replaced by steel shaft. New power plant has been installed and other buildings erected preparatory to resuming operations after idleness of more than year.

ROWE (Riverton)—Washing plant now under construction expected to start operating by Aug. 1. Capacity will be 100,000 tons washed ore monthly. In essentials plant will be similar to those operating on sandy ores of Western Mesabi Range. Two units of hydraulic operation are at work. Is stated that these two will remove 100,000 yd. of material each month.

MONTANA

Broadwater County

COMBINATION KEATING (Radersburg)—Suit of this company against R. L. Clinton and H. Gysbert Klenze, to recover title to mining properties in Broadwater County valued at $50,000, on trial in Federal Court, came to conclusion May 29, when by stipulation of parties Clinton was given title to mines, but agrees to transfer them to plaintiff upon payment to him of $5000 paid within year. Otherwise his title is to be confirmed in perpetuity. Four claims are involved which Clinton bid in at sheriff's sale, under judgment secured by the Combination Keating company. While he claims that he bought them for himself, company declared he acted for it and took title in trust for its benefit.

KEATING GOLD (Radersburg)—According to annual report, situation at company's properties is more promising now than it has been at any previous time. During last year main shaft has been sunk to depth of 1200 ft. The 1000 level has been driven north about 1160 ft., exposing values fully as good as on 800 level. Station cut at 1150 level disclosed values in gold and copper better than those on 800 level. A body of ore between the 800 and 1000 ft. levels, 900 ft. long and 200 ft. high has been blocked out. In addition to gold, the company is producing from 90,000 to 100,000 pounds of copper per month. There are on dumps about 120,000 tons of ore of gross value of $5 per ton that can be concentrated and directors are planning to install a plant suitable for this purpose. There is promise of railroad from mine to Northern Pacific line. Preliminary surveys have been completed and work of construction will commence within month.

Granite County

BROOKLYN (Maxville)—Deal for taking over this mine by syndicate of Minneapolis, St. Paul and Toronto capitalists has just been completed. Directors of new company have announced that first thing to be done will be construction of concentrating plant at the mine and the advancing of lower tunnel, which is below workings, distance of about 400 ft. Concentrator will be finished and lower tunnel completed by Aug. 1 and the entire mine put into operation by Aug. 15. C. W. Beckley, of Butte, is one of directors of new company.

Silver Bow County

NORTH BUTTE (Butte)—New electric hoist at Granite Mountain shaft now in full operation and ore is being hoisted steadily through that shaft instead of old Speculator shaft. Development work on 3000 level is promising and indicates presence of orebodies similar to those opened up on 2800 level.

NEVADA

Clark County

DUPLEX MINE (Searchlight)—This property sold by George R. Colton, G. F. Colton and Sarah J. Gill to Duplex Mining Co. for consideration stated to be $500,000.

Esmeralda County

MERGER MINES (Goldfield)—Work resumed May 25 in raise above 1260 level in effort to find continuation of Jumbo Extension oreshoot.

JUMBO EXTENSION (Goldfield)—Shoot of high-grade ore opened in raise from 952 level; this is downward extension of shoot developed on 880-ft. level. Drift 524 on 880 level is in ore assaying $121 per ton. On 1017 level ore struck in south drift.

NEW EMPIRE-GOLDFIELD MINES (Goldfield)—Company purchased four claims in Goldfield district upon which it held lease and bond for three months. New equipment will be installed and 150 ft. of shaft will be sunk to 450 level. Expected contact-oreshoot will be cut at depth of 300 ft.

Humboldt County

SEVEN TROUGHS COALITION (Seven Troughs)—Shipment of bullion valued at $10,044 made recently from 10-day mill run.

Lincoln County

YUBA LEASING & DEVELOPMENT (Pioche)—Mill being built will also treat custom ores, greatly aiding leasers and small properties in district.

DAY-BRISTOL (Pioche)—Second payment of $26,000 made by George E. Bent and associates. Final payment must be made to receiver by June 13. Expected operation of mine will begin when final payment made; this will undoubtedly cause revival of mining in Bristol and Jack Rabbit mining districts.

Lyon County

WESTERN NEVADA (Mason)—Work at this mine controlled by Nevada-Douglas Copper Co. under way. Boarding and bunk houses repaired; new blacksmith shop built. Water supply will be obtained from mine. Some development work under way; force will be increased as soon as air is supplied. Mine opened by 500-ft. shaft and levels at 100, 200, and 300 ft. Good tonnage copper ore developed; ore contains chalcopyrite, cuprite and native copper.

Nye County

TONOPAH ORE PRODUCTION for week ended May 29 was 11,001 tons, estimated value $223,978, compared with 10,548 tons at $215,824 week previous. Producers were: Tonopah Belmont Co., 3671; Tonopah Mining, 2950; Tonopah Extension, 1900; West End, 862; Jim Butler, 1200; Tonopah Merger, 311; North Star, 54; and miscellaneous leasers 53 tons.

WORK AT NEW CAMP OF VOLCANO, 18 miles from Tonopah, is under way. On Glenn & Musser property, scene of original discovery, three leases let; one leaser has struck high-grade ore, indications on other leases favorable. Company shaft down 15 ft.; high-grade shoot 15 in. wide and shoot milling-grade ore 8 ft. wide opened. On Weese property, 2 miles from Glenn & Musser strike, good-grade gold-silver ore opened. Four leases let.

LUCKY JIM (Tonopah)—This group of four claims at camp of Sylvanite being divided into 200x600-ft. blocks for leasing. One 200-ft. block will be developed on company account. Leases are let on royalty of 20% of net value of ore shipped and require 50-ft. shaft to be sunk.

Ormsby County

COMSTOCK TAILINGS in Carson River will be worked again this summer. Three companies, financed by Los Angeles and Eastern men, will operate between Empire and Dayton in Lyon County. Dredges, concentration and cyanide plants are being installed.

Washoe County

NEW TOWN OF LIMELIGHT being established on northern edge of Pyramid Lake, 2½ miles from Fernley-Lassen branch of Southern Pacific R.R., 50 miles north of Reno, by Nevada Industries Corporation. This company will develop immense deposit of limestone of remarkable purity. Deposit is three miles long; can be mined by quarrying. Samples assayed at University of Nevada ran 99.98% to 100% $CaCO_3$. First unit of plant being installed, other units to follow.

NEW MEXICO

Dona Ana County

VICTORIO (Cutter)—Property to be sold at public auction at Las Cruces, N. M. W. F. Jacoby named trustee in bankruptcy.

Grant County

EMPIRE ZINC (Pinos Altos)—Has begun concrete work for new mill.

WELCH & McKEE MINES (Hanover)—Company formed for operation of carbonate zinc claims adjoining Empire Zinc Co. Clyde M. Becker in charge. Development work being done.

ATWOOD (Lordsburg)—Company has begun shipments to Copper Queen reduction works at Douglas. Dumps being shipped. Active mining and development to begin soon. J. L. Wells in charge.

COPPER BASIN (Duncan, Ariz.)—Churn drilling being done on claims in New Mexico and Arizona. Small strike of gold ore made. Drilling has revealed good milling-grade copper ore. Messrs. White, McAllister & Phillips, of Tyrone, N. M., owners.

GOLD CROWN (Steeplerock)—Company being incorporated by E. A. Wayne, formerly of Ernestine, Mogollon, and associates. Will operate mines at Twin Peaks known as New Strike and Morris group. Two mills also included. Machinery received this week for equipping one of mills at Clear Lake. Davis Gough is metallurgist. Company has over 50 claims.

Sandoval County

COSSAK (Bland via Domingo)—Operating Lone Star mine and steadily treating 100 tons ore daily with new stamp and cyanide mill consisting of Blake crusher, 20 stamps, 1050 lb., two 5x18-ft. tube mills, duplex Dorr classifier and seven-tank cyanide plant run on the continuous agitation, counter-current decantation system consisting of two Dorr agitators and five Dorr thickeners. Power supplied from wood burning steam plant mile distant. Power transmitted to mine, three phase, 6600 volts. Individual induction motors in mill; 12x14 air compressor at mine. Waugh drills used. Company making good recovery and shipping bullion.

Sante Fe County

SAN MIGUEL MICA CO. (Ribera)—Company has filed articles of incorporation. Capitalization, $50,000. Directors are Messrs. Anderson, Groth and Scott of Las Vegas, N. M.

UTAH

Juab County

TINTIC ORE SHIPMENTS for the week ended May 28 amounted to 119 cars as compared to 125 the week preceding. Shipments from Sioux mill dump have been reduced pending the construction of a spur.

EAGLE & BLUE BELL (Eureka)—High-grade ore has been followed for 50 ft. below the 1700 level by an inclined winze; vertical winze, started to mine this ore, is down 25 ft. New stope has been opened between 1700 and 1550.

Salt Lake County

OHIO COPPER (Lark)—Negotiations for leasing this company's mine and mill are reported to be under way.

ALTA CONSOLIDATED (Alta)—Ore hauling started June 1. East drift from main tunnel is following 12 to 18 in. of ore in Brain fissure. West No. 1 drift is being driven toward quartzite-limestone contact.

ALTA TUNNEL & TRANSPORTATION (Salt Lake)—West drift from tunnel is in 60 ft., following east-west fissure, and has cut 2 ft. of carbonate ore. Main tunnel is in 1200 ft., and is being advanced. Heavy flow of water has been encountered. F. V. Bodfish is manager.

EMMA COPPER (Alta)—Stringers of mineral have been opened in 250-ft. crosscut, being driven to contact of two kinds of limestone, where ore is expected to make at intersection of mineralizing fissures. Progress of 8 ft. daily being made with machine drills. Some adjoining ground has been purchased. A. O. Jacobson is general manager.

MONTANA-BINGHAM (Bingham)—First shipment of ore made May 25. Ore is heavy sulphide; pyrite, with some chalcopyrite and chalcocite, and is expected to bring about $14 per ton. Main tunnel which is being driven under contract is expected to reach the Congor vein in July, thus completing contract. Five different properties will be able to use tunnel, and several contracts have been signed.

Summit County

PARK CITY ORE SHIPMENTS for month of May amounted to 9474 tons, estimated value $378,000, compared with 6033 tons in April; 7831 in March; 8517 in February, and 7859 in January. Producers were: Silver King Coalition, 4057; Daly Judge, 3575; Daly West, 1259; Silver King Consolidated, 875; D. W. Quincy, 95; Daly, 50; Ontario, 40; American Flag, 23; others, estimated, 500 tons.

SILVER KING CONSOLIDATED (Park City)—Mine is able to ship 60 to 85 tons daily, as soon as roads are better. Ore held back by hauling conditions will be sold at an increased profit of from $4 to $5 a ton, owing to rise in price of lead.

Tooele County

SHIPMENTS FROM OPHIR are about 75 cars monthly. The Ophir Hill is shipping two cars a day, and the Cliff one car every other day.

MONTANA (Ophir)—Work being done by Kelly interests of Chicago, and 20 men are employed mining copper-silver ore. This property has been idle owing to litigation.

MONO DEVELOPMENT (Stockton)—Fifteen leasers are working on various parts of this property, which consists of 300 acres of patented ground in Dry Cañon. Silver-lead-copper ore is being mined on Ferguson & Wilson lease; strike of high-grade ore made recently on Fuller-Cavanaugh block.

CANADA

Ontario

COLEMAN DEVELOPMENT (Cobalt)—These claims in the southeastern section of the camp have been taken over by Adanac Silver Mines, Ltd., now being organized, with capitalization of $2,500,000, and operations will shortly be commenced with Andrew Grierson in charge.

BEAVER AND TIMISKAMING—A disagreement has arisen between management of these companies and Northern Ontario Light, Heat & Power Co., which has been supplying them with power. Contracts have expired and company has submitted new agreement raising price about 50% over old rate, which management refuses to accept. Power company threatens to discontinue supply if its terms are not accepted.

NORTH DOME (Porcupine)—This property, which has been in liquidation for several months, has been bought in by Timiskaming Mining Co. for $10,000, but as there was several thousand dollars owing Timiskaming by North Dome the actual cost was only about $2000. During days of Porcupine boom Timiskaming paid $250,000 for controlling interest in North Dome. It is understood that developments on property have always been unsatisfactory.

AFRICA

Rhodesia

GOLD PRODUCTION in April was 75,577 oz., an increase of 3844 oz. over March. For four months ended Apr. 30 total was 286,051 oz. Other production in April was 14,590 oz. silver, 282 tons copper, 4 tons lead, 130 tons asbestos, 790 tons chrome ore and 27,210 tons coal.

The Market Report

Metal Markets

NEW YORK—June 9

Copper has risen sharply and lead jumped up in a remarkable manner. The rise in spelter appears to have reached the climax—for the time being, anyway.

Copper, Tin, Lead and Zinc

Copper—About June 4 an active demand began to develop and the buying was of such magnitude as to start an advance in the price, there being about ¼c. difference between the opening and closing prices of each day for several days subsequently. By June 8 the market had reached the level of 19¾c., regular terms, or about 19.55c., cash, New York. After selling liberally at that price the principal producers raised their asking price to 20c., regular terms, and late Wednesday afternoon that price was reported as having been realized. However, there was rather a halt in the buying of Wednesday as compared with the previous day. The aggregate of business during the week was large. The manufacturers of brass for ammunition purposes were the principal buyers.

The Calumet & Hecla price for its Lake copper is 23c. There is understood to be somewhat less active demand at that price. Several users of Lake copper are now buying electrolytic and it looks as if the extraordinary differential between C. & H. copper and electrolytic is tending to contract.

The prices for electrolytic copper and standard in the London market are entirely out of joint for the reason that there is no longer a free market for standard inasmuch as no copper may be exported from England. Foreign refiners are therefore unable to buy warrants and accept delivery of the copper for shipment to their refineries.

Copper Sheets base price nominally 24c. per lb. for hot rolled and 25c. for cold rolled. Usual extras charged and higher prices for small quantities. Copper wire, 20@20½c. per lb. at mill, carload lots.

Copper Exports week ended May 22 are reported by the Department of Commerce at 15,183,075 lb. Principal items were 6,394,056 lb. to France, 4,213,731 lb. to Great Brtain and 2,804,214 lb. to Italy. Imports were 1,288,145 lb. metal and 581,773 lb. in ore and matte; 1,869,918 lb. in all, chiefly from Canada.

Visible Stocks of Copper in Europe May 30 are reported as follows: Great Britain, 20,312; France, 2430; afloat from Chile, 2025; afloat from Australia, 4200; total, 28,967 long tons, an increase of 1538 tons over the May 15 report.

Tin—This market has been active and strong. On June 7 there was a turnover that may almost be a record, the transactions of that day being estimated at 800 to 1000 tons. Subsequently the market was more quiet, but it continued to be very firm.

Visible Stocks of Tin on May 30 are reported as follows: London, 6523; Holland, 63; United States, excluding Pacific ports, 8060; total, 14,646 long tons, a decrease of 1139 tons during April. The stocks include tin afloat.

Lead—This metal has come to the center of the stage as the principal performer. Buyers—consumptive and speculative—took the bit in their teeth and ran away with the market, the A. S. & R. Co. completely losing control of it. The successive advances made from day to day by it were simply to catch up with the selling by the independent producers. The latter took the business of all comers and for all kinds of forward deliveries, realizing handsome premiums, while the principal producer supplied its regular customers on its regular terms, i. e., delivery during the next 30 days. In the aggregate a very large business was done, perhaps the largest of any week in recent history.

Spelter—At the end of our last week of record spelter was in a crazy position, and one that it was impossible to quote with accuracy. The same condition continued into the present week, but after the first two days the demand vanished and since that time the market has been uncertain and rather wabbly, with quotations scarcely more than nominal. Three producers reported no business done during the week, one reported a little in the early part, none in the latter part. One reported a fair business done right along. The total of transactions was light and far below what it was during the previous week. Ammunition makers appear to have satisfied their requirements, or are disposed to hold off and await developments, while as for the galvanizing business it has been simply paralyzed. Consumers have been offering spelter for resale, prompt delivery at 26c., without finding buyers, while producers were of course willing to meet that price. June-July spelter was offered at 25c. on June 9.

The British government has forbidden the use of spelter in Great Britain for any but military purposes except by its express permission.

Zinc Sheets are again higher; base price $33 per 100 lb., f.o.b. Peru, Ill., less 8% discount. Usual extras charged.

DAILY PRICES OF METALS IN NEW YORK

June	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc
			Electrolytic, Cts. per Lb	Spot, Cts. per Lb	New York, Cts. per Lb.	St. Louis, Cts. per Lb.	St. Louis, Cts. per Lb.
			18.50		5.00	4.92½	23.00
3	4.7831	49¼	@18.70	37½	@5.15	@5.07½	@27.00
			18.50		5.20	5.12½	24.00
4	4.7838	49⅛	@18.80	38	@5.50	@5.35	@27.00
			18.80		5.20	5.12½	24.00
5	4.7838	49¼	@19.05	39	@5.50	@5.37½	@26.00
			19.05		5.50	5.42½	24.00
7	4.7831	49⅜	@19.30	39	@6.00	@5.87½	@26.00
			19.50		5.75	5.67½	24.00
8	4.7838	49½	@19.60	40	@6.25	@6.12½	@26.00
			19.55		6.00	5.92½	24.00
9	4.7838	49⅜	@19.80	40¼	@6.50	@6.37½	@25.00

The quotations herein are our appraisal of the average markets for copper, lead, spelter and tin based on wholesale contracts for the ordinary deliveries of the trade as made by producers and agencies; and represent, to the best of our judgment, the prevailing values of the metals, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.17c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumers and is subject to discounts, etc. The price quoted for copper on "regular terms" is the gross price including freight to the buyer's works and is subject to a discount for cash. The difference between the price delivered and the New York cash equivalent is at present about 0.20c. on domestic business. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Prime Western brands. Only the St. Louis price is herein quoted, St. Louis being the basing market. We quote the New York price at 17c. per 100 lb. above the St. Louis price.

Silver quotations are in cents per troy ounce of fine silver.

Some current freight rates on metals per 100 lb. are; St. Louis-New York, 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1c.

LONDON

June	Silver	Copper				Tin		Lead		Zinc	
		Spot		3 Mos.	Best Sel'td	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
		£ per Ton	Cts. per Lb.								
3	23 5/16	80⅜	17.52	81⅛	....	159½	159	23 7/16	5.09	95	20.64
4	23½	81½	17.63	82½	....	162¼	161¾	23⅜	5.07	95	20.64
5	23 5/16	.....	.....	.....	....	.....	....	.....	.....	....	....
7	23⅜	83	18.03	84	....	164½	163¾	24½	5.32	102½	22.17
8	23 7/16	82½	17.92	83½	....	166½	165½	25¾	5.59	105	22.81
9	23½	83	18.03	84	....	166½	165½	26⅜	5.78	105	22.81

*Not received.

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at 4.80. £15 = 3.21c.; £20 = 4.29c.; £30 = 6.43c.; £40 = 8.57c.; £60 = 12.85c. Variations, £1 = 0.21⅜c.

Other Metals

NEW YORK—June 9

Aluminum continues active and strong. The chief producer here is reluctant to quote except on contracts or to customers. Stocks of imported metal are small. Current quotations are rather nominal at 27@29c. per lb. for No. 1 ingots, New York. The latest London price reported is £105@110 per long ton—equal to 22.8@23.9c. per lb.—for ingots.—**Antimony** is again strong; though sales have not been large there is some inquiry. Ordinary brands range 35@38c. per lb. for spot. Some offers of Chinese at 33c. for future delivery are reported. Cookson's is altogether nominal, 46@48c. being named, with no sales.—**Nickel** is steady and unchanged. Ordinary forms are 40@45c. per lb., according to size and terms of order. Electrolytic, 3c. per lb. higher.—**Quicksilver** is strong and rather excited. In New York $85 per flask of 75 lb. is quoted for large orders; for smaller parcels as high as $95@100 is named. San Francisco price is reported by telegraph at $75@80, with some sales up to $85 per flask. London price has advanced sharply, £15 per flask being quoted from first hands.

Gold, Silver and Platinum

NEW YORK—June 9

Gold sales from the U. S. Assay Office in New York in May were $2,560,570, being $43,647 less than in April. For the five months ended May 31 the total sales were $32,807,070 in 1914, and $13,109,898 in 1915; a decrease of $19,697,172 this year.

Some additional receipts of gold at New York from Ottawa are reported this week.

Gold in the United States June 1 is estimated by the Treasury Department as follows: In Treasury against gold certificates outstanding, $1,108,216,669; in Treasury current balances, $209,994,409; Federal Reserve banks against notes outstanding, $5,007,814; in bank and circulation, $591,567,104; total, $1,914,785,996, an increase of $25,643,531 during May.

Platinum is still quiet and unchanged, with prices inclined to be weak and sales small. Dealers ask $37@39 per oz. for refined platinum, and $41@44 per oz. for hard metal.

Our Russian correspondent reports that the market has improved. The demand at Petrograd continues both for small and large quantities. At Ekaterinburg speculators are buying up small lots notwithstanding the export prohibition. The market is supported by the small production of the year and by the expectation of a large demand after the close of the war. The current price at Ekaterinburg is 8.50 rubles per zolotnik—$31.96 per oz.; at Petrograd 33,500 rubles per pood—$32.83 per oz.—both for crude metal, 83% platinum.

Silver has shown very little activity. The fluctuations for the week have been within ¾d. While there is no great pressure to sell, buyers are not eager. Inquiry from the Bazaars has been very moderate.

Coined silver in the United States June 1 is reported by the Treasury Department as follows: Standard dollars, $568,272,478; subsidiary coins, $185,293,474; total, $753,565,952. Of the dollars $495,177,000 are held in the Treasury against silver certificates outstanding.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—June 5

The open market price for 60% zinc ore advanced this week to $87.50 per ton. The base price paid this week for 80% lead ore was $60 per ton.

SHIPMENTS, WEEK ENDED JUNE 5

	Zinc Ore, Lb.	Lead Ore, Lb.	Sulphur Ore, Lb.
Week	4,259,030	60,000	836,780
Year	79,727,150	2,975,190	11,106,370

Shipped during week to separating plants, 4,993,320 lb. zinc ore.

JOPLIN, MO.—June 5.

Blende, high price $112; assay base per ton of 60% zinc, premium ore $110@100; medium grades $107@95; lower grades down to $85. Calamine base 40% zinc, per ton $80@70; average, all grades of zinc, $95.46 per ton. Lead, high price $59; base $58 per ton of 80% metal content; average, all grades of lead, $57.12 per ton.

SHIPMENTS WEEK ENDED JUNE 5

	Blende	Calamine	Lead	Values
Totals this week...	13,803,860	1,090,600	2,574,800	$783,080
Totals this year....	251,597,890	22,635,460	37,599,930	$9,597,550

Blende value, the week, $678,070; 23 weeks, $8,126,150.

Calamine value, the week, $32,890; 23 weeks, $441,050.

Lead value, the week, $72,120; 23 weeks, $930,350.

Purchases of premium blende were made just after noon Thursday at $100, later the price was advanced to $102, then $105. Friday opened with $105.50 climbing to $106, $107 and the day wound up with a sale of 600 tons at $110, and this for prime medium grade ore. Smelters are coming to believe more in at least a semblance of permanancy to the market and, while there is an abundance of Australian and western ore around 50% to 54% zinc content, the demand being for immediate delivery, the ore of this district can be converted into metal with so much greater rapidity that a price is being paid that will get it. The most noteworthy feature of the situation is the final shipment of all previous reserve stock, of which there was upward of 20,000 tons three months ago. One newly made bin of 1000 tons is all the salable ore in the district now, aside from the weekly production. Instead of the production increasing, as would seem most probable with these stimulating prices, various circumstances have combined to reduce the output. Dissatisfaction where the wage scale was not advanced led some miners with families to leave for the berry fields where the wife and children could also earn some wages, and still others have gone or arranged to leave for the wheat harvest fields of Oklahoma and Kansas. Again, where wages are advanced less labor is the return. The single man will work four days a week and earn as much or more as formerly in one week and lay off. During the past three weeks the output dropped to below 5000 tons per week, having previously reached nearly 7000 tons in one week, and ranged around 6500 tons for six previous weeks. The opening of new mines is handicapped by the scarcity of labor, and prospecting and development work is retarded by the higher price commanded. Still another item effects the labor situation. Miners are forming companies of their own, leasing abandoned mines and prospecting for themselves.

Iron Trade Review

NEW YORK—June 9

There is little to be reported since last week. Domestic business shows a tendency to increase, and the general tone of the trade is good.

Foreign orders are still large. The main difficulty is the shipping, not only the high rates, but the difficulty of finding tonnage available.

Pig iron is more active and some large sales of basic iron are reported. Foundry orders for third quarter and second half are under discussion.

PITTSBURGH—June 8

While the steel trade at large, including independent steel interests as well as officials of the Steel Corporation itself, were rather confident that the famous steel suit would be decided in favor of the Corporation, the sweeping nature of the Federal court decision of June 3 has caused a decidedly cheerful feeling throughout the steel trade. There will be no change whatever in the attitude of steel sellers by reason of the decision, so far as can be observed, but it is believed the steel market will be greatly helped, partly through the stimulus the decision in favor of "big business" should give to business generally.

The steel trade, however, does not seem to be standing in need of fortuitous encouragement at this time, for the volume of actual shipping orders entered has continued to increase. Nearly all the mills have been able to increase their rolling schedules, as compared with a fortnight ago, while there is more tonnage in sight. Operations throughout the steel industry are easily at an average of more than 75% of the rated capacity, though given an ample labor supply and good weather conditions most of the mills would probably be able to exceed their regular ratings. Steel prices are showing a further firming up tendency.

Chemicals

NEW YORK—June 4

The general markets continue quiet with about the usual business forward, but no special activity.

Arsenic—Demand continues moderate and the market is generally quiet. The quotations are about $4 per 100 lb. for both spot and futures.

Copper Sulphate is steady and unchanged on a fair business. Quotations are $7 per 100 lb. for carload lots and $7.25 per 100 lb. for smaller parcels.

Nitrate of Soda—The market is a little irregular but fairly strong. The current quotation is unchanged at 2.30c. per lb. for spot and all positions this year.

Pyrites—Imports at Baltimore for the week included 9321 tons pyrites from Huelva, Spain.

Assessments

Company	Delinqe	Sale	Amt.
Advance, Ida., (post.)	.....	July 1	$0.005
Argenta, Ida.	May 10	June 10	0.001
Belcher, Nev., (post.)	June 14	July 8	0.15
Best & Belcher, Nev., (post.)	June 14	July 8	0.05
Blue Star, Ida.	June 19	July 10	0.01
Carbonate, Ida.	July 23	.....	0.001
Cash Boy, Nev.	May 17	June 17	0.01
Contact Copper, Mich.	May 15	.....	0.50
Crown Point, Nev., (post.)	June 16	July 8	0.15
Duluth, Ida.	June 5	July 8	0.001
Glen Metal, Ida.	May 31	July 1	0.002
Hancock Cons., Mich.	Sept. 1	.....	1.00
Hancock Cons., Mich.	Jan. 3	.....	1.00
Houghton, Mich.	May 25	.....	1.00
Idora, Ida	June 3	July 2	0.005
Laclede, Ida.	May 24	June 14	0.003
Majestic-Idol, Nev.	Dec. 15	July 20	0.005
Mayflower, Ida.	June 15	July 17	0.005
Mineral Range, Utah	May 24	.....	0.003
Monarch Pitts., Nev.	June 14	July 14	0.01
Mullan, Ida., (post.)	.....	June 24	0.002
Nevada-Douglas, Nev.	Apr. 24	June 10	0.10
New Arcadian, Mich.	June 1	.....	0.50
New Arcadian, Mich.	Dec. 1	.....	0.50
North Bunker Hill, Ida.	June 12	July 17	0.002
North Lake, Mich.	.....	June 15	1.00
Ophir, Nev	June 4	June 25	0.05
Overman, Nev.	May 19	June 8	0.05
Rainbow, Ida.	July 7	Aug. 7	0.002
Raymond-Illinois, Utah	May 24	June 9	0.005
Raven, Ida.	May 15	June 14	0.0006
Rhode Island, Ida.	June 24	July 24	0.001
Royal, Ida.	June 1	July 6	0.0015
Selma, Utah.	May 29	June 16	0.005
Silver Moon, Ida.	May 18	June 18	0.005
Silver Mountain, Ida.	May 15	June 15	0.002
Silver Pick, Nev.	June 5	July 12	0.01
Treasure, Calif.	.....	.....	0.05
Union, Nev	June 18	July 9	0.05
United Tintic, Utah.	May 25	June 15	0.005
Utah United, Utah.	May 20	June 10	0.01
Virginia, Ida., (post.)	.....	June 29	0.02
West Tonopah Con., Nev.	July 10	Aug. 10	0.01
Wisconsin, Ida.	May 15	June 15	0.003
Yellow Jacket, Nev., (post.)	June 14	July 8	0.15

Stock Quotations

The feature of the week on the stock exchanges was the sharp upturn on receipt of the Steel decision, followed by weakness on further consideration of the German situation. All lead stocks were remarkably strong.

COLO. SPRINGS June 8		SALT LAKE June 8	
Name of Comp.	Bid.	Name of Comp.	Bid.
Acacia	.04	Beck Tunnel	.04
Cripple Cr'k Con.	.01	Black Jack	.08½
C. K. & N.	.03	Colorado Mining	.09
Doctor Jack Pot.	.10¾	Crown Point	.01½
Elkton Con.	.38	Daly-Judge	6.00
El Paso	.90	Gold Chain	.10
Findlay	.04¾	Grand Central	.56
Gold Dollar	.03	Iron Blossom	.67
Gold Sovereign	.05	Little Bell	.14
Golden Cycle	1.77½	Lower Mammoth	.03
Isabella	.17½	Mason Valley	2.50
Jack Pot	.06½	May Day	.14½
Jennie Sample	.02	Opohongo	.00½
Jerry Johnson	.04	Prince Con.	.45½
Lexington	‡.008	Seven Troughs	.01½
Mary McKinney	.35½	Silver King Coal'n.	3.37½
Pharmacist	.01	Silver King Con.	‡1.87½
Portland	1.41	Sioux Con.	‡.03
Raven B. H.	.02½	Uncle Sam	.04
Vindicator	1.63	Yankee	.01

TORONTO June 8			
Bailey	.02¾	Dome Exten.	.07
Coniagas	.05	Foley O'Brien	.30
Peterson Lake	.22	Hollinger	25.50
Right of Way	.03½	Imperial	.05
Seneca Superior	1.12½	Jupiter	.09
Silver Queen	.01	McIntyre	.42
T. & Hudson Bay	18.50	Pearl Lake	.01
Timiskaming	.34	Porcu. Crown	.80
Wettlaufer-Lor.	.03	Preston E. D.	.01½
Big Dome	14.37½	Rea	.10

SAN FRANCISCO June 8			
Comstock Stocks		Misc. Nev. & Cal.	
Alta	‡.04	Belmont	4.50
Andes	.08	Jim Butler	.80
Belcher	.25	Lone Star	.06
Best & Belcher	.07	MacNamara	.03
Caledonia	.26	Midway	.17
Challenge Con.	.06	Mont.-Tonopah	.30
Confidence	.07	North Star	.15
Con. Virginia	.08	Rescue Eula	.09
Gould & Curry	.03	West End Con.	.87
Hale & Norcross	.03	Atlanta	.32
Julia	‡.01	Booth	.52
Mexican	.42	C.O.D. Con.	.04
Occidental	.79	Comb. Frac.	.09
Ophir	.13	Jumbo Extension	1.50
Overman	.06	Pitts.-Silver Peak	.12
Potosi	‡.01	Round Mountain	.43
Savage	.02	Sandstorm Kendall	.07½
Sierra Nevada	.08	Silver Pick	.10
Union Con.	.16	Central Eureka	.15
Yellow Jacket	.32	So. Eureka	‡2.25

N. Y. EXCH. June 8	
Name of Comp.	Clg.
Amalgamated	73¾
Am.Sm.&Ref.,com	75¾
Am. Sm. & Ref., pf.	106
Am. Sm. Sec., pf. B.	80
Anaconda	35½
Batopilas Min.	1¾
Bethlehem Steel	159¾
Bethlehem Steel, pf.	114½
Chino	46½
Colo. Fuel & Iron.	30
Federal M. & S., pf.	50
Great Nor., ore., ctf.	34½
Guggen. Exp.	63½
Homestake	118
Inspiration Con.	31½
Mex. Petroleum	76
Miami Copper	26
Nat'l Lead, com.	65½
National Lead, pf.	110
Nev. Consol.	15½
Ontario Min.	3¾
Quicksilver, pf.	¾
Ray Con.	24¾
Republic I&S, com.	28¾
Republic I&S, pf.	86
SlossSheffi'd, com.	33
Tennessee Copper	36
Utah Copper	68½
U. S. Steel, com.	58¼
U. S. Steel, pf.	110

N. Y. CURB June 5	
Name of Comp.	Clg.
Alaska Juneau, w.i.	13¾
Alta Con.	.69
Beaver Con.	.29
Big Four	‡.07
Blue Bell	.03
Braden Copper	7½
Buffalo Mines	‡1⅛
Can. Cop. Corpn.	1⅛
Can. G. & S.	.03
Caribou	.50
Cashboy	.07
Chambers Ferland	.15
Con. Ariz. Sm.	.81½
Con. Coppermines	2¾
Davis-Daly	1¾
Diam'field-Daisy	‡.07
Dia. Black B.	.08
Florence	.54
Goldfield Con.	1½
Goldfield Merger	.25
Greene Cananea	35
Kerr Lake	4⅛
La Rose	.47
McKinley-Dar-Sa.	.32
Mines of Am.	2.50
Nevada Hills	.24
New Utah Bingham	3½
Nipissing Mines	5.75
Ohio Copper	.23
Oro	.12
South Utah	‡¾
Stand'd Oil of N.J.	402
Standard S. L.	1⅛
Stewart	2⅛
Tonopah	7¾
Tonopah Ex.	3¾
Tonopah Merger	.41
Tribullion	¾
Tularosa	½
West End Ex.	.04
Yukon Gold	2.62½

LONDON May 27	
Name of Comp.	Clg.
Alaska Tre'dwell	£7 7s 6d
Cam & Motor	0 15 0
Camp Bird	0 5 6
El Oro	0 7 3
Esperanza	0 7 9
Mexico Mines	3 12 6
Oroville	0 12 0
Santa Gert'dis.	0 7 6
Tomboy	1 4 6
Tough Oakes	0 9 0

BOSTON EXCH June 8	
Name of Comp.	Clg.
Adventure	3½
Ahmeek	385
Alaska Gold M.	35¾
Algomah	3
Allouez	57¼
Am. Zinc	55
Ariz. Com., ctfs.	8½
Bonanza	.35
Butte-Ballaklava	3½
Butte & Superior	77½
Calumet & Ariz.	63½
Calumet & Hecla	591
Centennial	20
Cliff	1½
Copper Range	55½
Daly West	3½
East Butte	12½
Franklin	10½
Granby	85½
Hancock	21
Hedley	28
Helvetia	.55
Indiana	7½
Island Cr'k, com.	45
Island Cr'k, pfd.	89
Isle Royale	30½
Keweenaw	2½
Lake	14
La Salle	7
Mass	14
Mayflower	4¼
Michigan	1¼
Mohawk	75½
New Arcadian	11¾
North Butte	33
North Lake	2½
Ojibway	2
Old Colony	4½
Old Dominion	56
Osceola	85
Quincy	88
Santa Fe	2¼
Shannon	9½
Shattuck-Ariz.	28½
Superior	29½
Superior & Bost.	‡3¾
Tamarack	36
Trinity	5½
Tuolumne	.43
U. S. Smelting	42
U. S. Smelt'g, pf.	46
Utah Apex	4¾
Utah Con.	14¾
Victoria	2¾
Winona	4¼
Wolverine	62
Wyandot	1½

BOSTON CURB June 8	
Name of Comp.	Bid.
Alvarado	.70
Bingham Mines	.09½
Boston Ely	.25
Butte & Lon'n Dev.	.24
Calaveras	1¾
Calumet-Corbin	.09
Chief Con.	.82
Corbin	.90
Cortez	.30
Crown Reserve	.75
Eagle & Blue Bell	1⅛
First Nat. Cop.	2½
Houghton Copper	4¾
Iron Cap Cop., pf.	5
Majestic	.55
Mexican Metals	.16
Nevada-Douglas	.60
New Baltic	3½
Oneco	2
Raven Copper	‡.10
Smokey Dev.	.30
So. Lake	6¼
Tonopah Victor	‡.31
Trethewey	.14
United Verde Ext.	4⅛

‡Last Quotations.

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1913	1914	1915	1913	1914	1915
January	62.938	57.572	48.855	28.983	26.553	22.731
February	61.642	57.506	48.477	28.357	26.573	22.753
March	57.870	58.067	50.241	26.669	26.788	23.708
April	59.493	58.519	50.250	27.416	26.958	23.709
May	60.361	58.175	49.915	27.825	26.704	23.570
June	58.990	56.471	.....	27.199	25.948	.....
July	58.721	54.678	.....	27.074	25.219	.....
August	59.293	54.344	.....	27.335	25.979	.....
September	60.640	53.290	.....	27.986	24.260	.....
October	60.793	50.654	.....	28.083	23.199	.....
November	58.995	49.082	.....	27.263	22.703	.....
December	57.760	49.375	.....	26.720	22.900	.....
Year	59.791	54.811	.....	27.576	25.314	.....

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York Electrolytic		London Standard		London Best Selected	
	1914	1915	1914	1915	1914	1915
January	14.223	13.641	64.304	60.756	69.488	65.719
February	14.49	14.394	65.259	63.494	70.188	*
March	14.131	14.787	64.276	66.152	69.170	*
April	14.211	16.811	64.747	75.069	69.313	*
May	13.99	18.506	63.182	77.600	67.786	*
June	13.603	.....	61.336	.....	66.274	.....
July	13.223	.....	60.540	.....	64.955	.....
August	*	.....	‡	.....	‡	.....
September	*	.....	‡	.....	‡	.....
October	*	.....	‡	.....	‡	.....
November	11.739	.....	53.227	.....	*	.....
December	12.801	.....	56.841	.....	*	.....
Year	.....	.....	.....	.....	.....	.....

TIN

Month	New York		London	
	1914	1915	1914	1915
January	37.779	34.260	171.905	156.550
February	39.830	37.415	181.556	176.925
March	38.038	48.426	173.619	180.141
April	36.154	47.884	163.963	166.225
May	33.360	38.790	150.702	162.675
June	30.577	.....	138.321	.....
July	31.707	.....	142.517	.....
August	*	.....	‡	.....
September	32.675	.....	‡	.....
October	30.284	.....	‡	.....
November	33.304	.....	139.391	.....
December	33.601	.....	147.102	.....
Av. year	34.301	.....	.....	.....

LEAD

Month	New York		St. Louis		London	
	1914	1915	1914	1915	1914	1915
January	4.111	3.729	4.011	3.548	19.665	18.606
February	4.048	3.827	3.937	3.718	19.606	19.122
March	3.970	4.053	3.850	3.997	19.651	21.883
April	3.810	4.221	.688	4.142	18.225	21.094
May	3.900	4.274	3.808	4.182	18.503	20.347
June	3.900	.....	3.810	.....	19.411	.....
July	3.891	.....	3.738	.....	19.051	.....
August	3.875	.....	3.715	.....	‡	.....
September	3.828	.....	3.658	.....	‡	.....
October	3.528	.....	3.384	.....	‡	.....
November	3.683	.....	3.585	.....	18.500	.....
December	3.800	.....	3.662	.....	19.097	.....
Year	3.862	.....	3.737	.....	.....	.....

SPELTER

Month	New York		St. Louis		London	
	1914	1915	1914	1915	1914	1915
January	5.262	6.386	5.112	6.211	21.533	30.844
February	5.377	8.436	5.228	8.255	21.413	39.819
March	5.250	8.541	5.100	8.366	21.460	44.141
April	5.113	10.012	4.963	9.837	21.569	49.888
May	5.074	14.781	4.924	14.610	21.393	68.100
June	5.000	.....	4.850	.....	21.345	.....
July	4.920	.....	4.770	.....	21.568	.....
August	5.568	.....	5.418	.....	‡	.....
September	5.380	.....	5.230	.....	‡	.....
October	4.909	.....	4.750	.....	‡	.....
November	5.112	.....	4.962	.....	25.016	.....
December	5.592	.....	5.430	.....	27.369	.....
Year	5.213	.....	5.061	.....	.....	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton. * Not reported, ‡ London Exchange closed.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1914	1915	1914	1915	1914	1915
January	$14.94	$14.59	$13.23	$13.45	$13.99	$13.90
February	15.06	14.55	14.12	13.45	14.08	13.90
March	15.07	14.55	13.94	13.45	14.10	13.95
April	14.90	14.55	13.90	13.45	14.13	13.95
May	14.90	14.61	13.90	13.60	14.27	13.83
June	14.90	.....	13.90	.....	13.96	.....
July	14.90	.....	13.90	.....	13.90	.....
August	14.90	.....	13.90	.....	14.08	.....
September	14.90	.....	13.90	.....	14.03	.....
October	14.84	.....	13.75	.....	13.97	.....
November	14.59	.....	13.43	.....	13.83	.....
December	14.70	.....	13.45	.....	13.83	.....
Year	$14.88	.....	$13.78	.....	$14.01	.....